CONSUMPTION PATTERN OF ELECTRICITY IN RURAL AND URBAN AREAS: A CASE STUDY OF ROURKELA, SUNDERGARH DISTRICT OF ODISHA

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Submitted By

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CERTIFICATE

This is to certify that **Pragyan Dash** has done a study on **"Consumption Pattern of Electricity in Rural and Urban Areas: A Case Study of Rourkela"** under my supervision for the award of the master degree in **Development Studies** at the National Institute of Technology, Rourkela. This dissertation is an independent work of her own and does not constitute part of any material submitted for any research degree or diploma here or elsewhere.

(Dr.Ngamjahao Kipgen)

Thesis Supervisor

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Pragyan dash

CONTENTS

ABSTRACT

This present study entitled "**Consumption Pattern of Electricity in Rural and Urban Areas: a Case Study of Rourkela**" had been conducted in and around Rourkela city. This study will give a clear understanding and insights of the primary factors that are responsible for utilization of electricity in rural and urban areas. The determinants of household expenditures on electricity consumption of both the rural and urban areas are identified and analysed.

This study will discuss how in rural area people are not able to get electric connection legally using meter. This have lead to illegal way of getting electricity as the rural people's income are too low and they are not in a position of getting registration in Electrical Department. On the contrary, in urban areas people are paying subsidised electrical bill per month. Through this study, it was found that both in rural and urban areas that the meter readings are not checked on a regular basis.

This study will provide clear understanding regarding the difference between the consumption of electricity in rural and urban areas. Also, this study will provide immense knowledge about the hardships faced by the rural people and the lacunae on the part of the Government Officials chiefly the electric department. The findings of the present study may be useful to the electric department in solving the problems face by the rural people in providing their needs and in framing stringent measures and laws to use electricity more judiciously and legally.

CHAPTER ONE

INTRODUCTION

Electricity was introduced in Greek. William Gibert, an English physician, physicist and natural philosopher was the first to coin the term “electricity” derived from the Greek word for *amber*. The combinations of qualities and quantities act of community or human group’s use of resources for survival, needs, comfort and enjoyment is called consumption pattern. Consumption pattern is divided into three terms, broader terms include social process, narrow terms include energy demand, energy demand, energy utilization pattern , water conservation, water demand, water saving, related terms include consumer behaviour. When income raises agriculture sector and industrial sector get mechanized which lead to increase in population and consumption of electrification increases in both rural and urban areas. The main reason behind consumption of electricity increases is Indian economy is growing very fast it is due to globalisation, modernization and liberalization.

In present modern days electricity is highly essential for growing economy. Without electricity no single industry can run or exist. Discovery of electricity is a blessing to this world. Not only electricity helps to run industry but it also helps to common human beings because it provides comforts and luxury and satisfies their needs. Kerosene oil lanterns and gas lamps are used in past but now in the present days electricity is been used. By merely switching on the button and there is the day-like light even in the darkest night! Moreover, during summer electric fans, air conditioning plants are used to provide us with cool atmosphere. And in winter, heating appliances are used to keep the room warm. Electric bells, press and stove are things of every-day use. People keep refrigerators in their homes to keep their food in a fresh condition. Indeed electricity serves as a faithful domestic servant in daily life. With the help of electricity many diseases are to-day cured by electric treatment. Surgeons will not be able to carry on operations as their instruments and machines are operated by it. X-ray machine which enables the doctor to take the photograph of the internal parts of the body can be operated only with its help. Briefly speaking, many men will meet their death much earlier without it. In the present period many big and heavy machines are been used to run machines. But these machines can run only through help of electricity. In many progressive countries, like Japan, electric power is used in small scale and cottage industries. In our own country we find flour mills, crushers, saw mills, etc. functioning with

electricity. The use of such small machines in our village has helped in improving the condition of the villagers. Thus, electric power is helping in the growth of industries. To increase our food production irrigation facilities have to be provided. Electricity is being used in the operation of tube wells in the villages. Now in big cities, electric furnaces are being used to cremate dead bodies.

Electricity can broadly be divided into two types, namely social and economic aspects. In general, electricity is mainly used in household level in order to light bulbs, fans, TV, computers, phone, washing machine air conditioner and other electrical assets. For over 30 years the World Bank and other organisations have studied the social benefits of electricity access and have noted that these benefits usually derive from the longer days that powered light bulbs offer to the household. Mainly children and women are highly benefited from this electricity, previously children used to study during day time and during night time they used to light candle or lamp in order to study. Which create eye problem and they face lot of problem but now children's are able to study properly because electricity is been provided and it reduce their stress . in past women used to use their physical power to do work but after electricity it reduce their physical work, in this way women and children are highly benefited, this is social benefit of electricity. Economic benefits related to production sector. The growth of businesses or farms using electricity will then increase demand for electricity, leading to a virtuous growth cycle profitable to both electricity providers and rural communities. Such economic growth is obviously an important achievement of any rural electrification programme. There are many small and large scale industries are found in rural areas which are running with the help of electricity. In urban areas large numbers of industries are there without electricity it cannot run. Electricity helps to run these industries and which lead to increase the production level of our country which lead to increase the income and per capita income also increases, thus we can say electricity is also and vital tool which is responsible to lead economic growth of our economy. Electricity is highly essential in this modern day which provides both social and economic benefits to humans and nation.

1.1 LOCATION OF THE STUDY

My project entitled "Study on Consumption Pattern of Electrification in Rural and Urban Areas: A case Study of Rourkela" was conducted during the month of December from 5th to 27th December, 2013. The location of my field study is Rourkela city and the surrounding rural areas. Rourkela city is in the Sundergarh district of the Odisha state. Rourkela is widely

known for its steel plant and the NIT. Data were collected from different rural villages of Bisra block namely, Dalposh, Jabpanposh, Bijadehi, Bartoli, Jogitoli, and Santoshpur and in urban areas data were collected from Sector 4, Sector 3, cheap type quarters and Executive quarters, Chend and Koelnagar. For my analysis I have taken 200 samples.

1.2 STATEMENT OF THE PROBLEM

There is a close relation between electricity consumption and economic growth. It was studied that those countries whose income level is higher there consumption of electricity is also higher. When a country condition improves it was seen their level of electricity consumption also increases. As we know India is a developing country and recently India economic growth is been increasing day by day in recent trend. Around 77 percent Indian economy grow during 2000 and 2007 and around 60 percent increase in electricity consumption.

Electricity is highly essential for economic development of a country but electricity play a vital role in improving the standard at household level. The millennium development goals is been able achieve only when modern energy is been used instead of traditional energy which had improved the quality of developing countries. In developing countries the production sectors were running with the help of electricity and the production level was increasing day by day which have improved the standard of developing countries.

The disparity between income and energy poverty, found in rural India is an important issue in this present context. This includes modern energy mainly the use of electricity. It was studied from various articles that India is about 57 percent of electrification found in rural India and 95 percent of electrification found in urban areas. In rural areas of Rourkela people are mainly using kerosene for lighting lamps and using charcoal and wood for preparation of food. These are inferior types for lighting. And in urban areas of Rourkela people are using modern energy like electricity for lighting and cooking food and also using LPG for cooking. It is evident from this that the poor are not able to get access electricity efficiently.

1.3 OBJECTIVE OF THE STUDY

The main objectives of my study are as follows:

- The objective of my study would be to analyse the determinants of changing in consumption pattern of electricity in rural and urban areas.
- To develop a holistic understanding regarding utility rate of electricity in rural and urban area.

- To determine the expenditure in rural and urban areas on electricity consumption.
- To identify the number of household were electrified in rural area.

1.4 LIKELY SIGNIFICANCE OF THE STUDY

Following points are few of the likely significance of my study:

- This study will give a descriptive analysis of how change in consumption pattern electricity is increasing in both rural and urban area.
- This study will provide – what are the factors responsible for the rise in consumption pattern of electricity and the sufferings face by the poor people without electricity in rural areas.
- This study will help us to know why rural people are using electricity illegally and what reasons are behind this situation and how urban people are enjoying more benefits as compared to rural areas.
- This study will provide to understand that electricity of 100 watt is been provided to BPL card holder free but it is not sufficient for the rural people because the voltage level of electricity is very low.
- This study will also explain how *china meter* remains only for name sake but do not provide any fruitful. This shows how the rural poor people are mislead by electrical officials.

1.5 RESEARCH METHODOLOGY

This study on consumption pattern of electricity both in rural and urban areas was carried out in and around Rourkela city. The following research tools have been used for my field study:

SAMPLING: Two types of samples are been taken into account. First, purposive sampling – this method was adopted in order to select the study areas. Second, random sampling – this was used for selecting the sample respondents. Random sample are been taken because the number of households in a single village consist of more than 350 to 400. Therefore, I have used random sampling to collect data for my study.

SAMPLE SIZE: In this study around six villages are selected namely, Dalposh, Jabpanposh, Bijadehi, Bartoli, Jogitoli, Santoshpur and in urban areas SAIL quarters namely, Sector 3, Sector 4, Cheap type, Executive quarters and Koelnagar (privately owned) are been taken

into account. In total I have taken 200 household for my study out of which 100 sample were taken from rural areas and 100 from urban areas of Rourkela respectively.

DATA COLLECTION: For collecting the data, I used both primary and secondary sources. Primary data was collected by interviewing people of both rural and urban household. For gathering quantitative data household survey was conducted using pretested schedules. The secondary data's were collected from related articles, journals, literature, documents, published reports. I was also partly a participant observer though it was short duration of study. This enhances my findings and enables me to connect the literature with the field.

DATA ANALYSIS: Since my study involves both qualitative and quantitative data I used an SPSS analysis to interpret the quantitative data. Quantitative data were tabulated column wise and entered in an excel sheet whereas, qualitative data were interpreted based on the information collected from field study through interview and observation.

1.6 CHAPTERIZATION

This dissertation is divided into four sections – four main chapters. The first chapter givea brief introduction on the importance and benefits of electricity in the present modern context and an overview of electricity consumption in India and also provided the location of my field site. This chapter also highlights the objective of my study, likely significance of my study and the research tools used in my field study. The second chapter give a brief review of the existing literature and also tries to reflect my field observation and experiences by pointing out the lacunae and gaps in the existing study on consumption pattern of electricity. In this study attempts was made to point out the missing link in some of the studies conducted. Chapter three basically deals with the data analysis. Here it was discuss about some of the factors determining the consumption of electricity. It was also highlight some of the findings of my study. Finally the conclusion chapter give a brief summary of the field study and also give a humble suggestions and limitations of the study.

CHAPTER TWO

REVIEW OF LITERATURE AND GAPS THEREIN

Human beings in general use two types of combination both qualities and quantities act for their own survival and comfort, luxury, enjoyment is called consumption pattern. Consumption pattern was divided into three aspects – broader term includes the social process, and the narrow terms includes energy demand, energy utilization pattern, water consumption, water demand, water saving, related terms include consumer behaviour. India is a developing country and after 1991 India is growing very fast and so it the population of India. Due to the impacts of globalization, liberalization and urbanization, it leads to mechanised agriculture sector and industrial sector and income of people increase and their demand for luxury good increase and consumption of electricity also increases in both rural and urban areas. In India the per capita average annual domestic electricity consumption in 2009 was 96 KWH in rural area and 288 KWH in urban areas it seems that urban people are using more electricity as compare to rural areas. But at present India is suffering from shortage of electricity generation capacity even though it is the world fourth largest energy consumption after United States, china and Russia. The international energy agency estimates India need an investment of at least $ 135 billion to provide universal access of electricity to its population.

H. Craig Petersen (1982) in his study of "electricity consumption in rural versus urban areas" explained that electricity using devices, climate and demographic characteristics' were the most important determinants characteristics and were the important determinants of variations in household electricity consumption. He further explained that there are six possible factors which are also responsible for greater consumption of electricity in rural areas and urban areas is due to different tariffs; second, it may due to more using electricity devices, thirdly in urban housing stock may be more energy sufficient; fourthly, the rural location or climate must be cooler than urban areas; fifthly, rural and urban residents may have different demographic characteristics which relate to more use of electricity and finally variations in the intensity of use of electricity consuming devices. Also, he argues that these are the few reasons for which consumption of electricity is been varying in both rural and

urban areas. Following this study, I found that these characteristics are also responsible for consumption electricity in my present study that is "the study of consumption pattern of electrification in rural and urban areas". Also, in my study, I found that people whose incomes are very low are spending huge amount of money in drinking. This could be another factor responsible for which they are unable to pay the electricity bill and using the electricity in an illegal way. However, in urban areas income of people are very high as comparison to rural people and they are getting electricity from SAIL authority at a very subsidised and minimal cost.

Bikramjit Sinhna and IndranilBiswas (1982) have made a study on "rural energy security in India." They had explained that the need of electricity is different from rural to urban. Because in rural areas people depend on fuel wood, charcoal, kerosene to meet their energy requirement and use small amount of electricity for lighting (cf. Cecelski et al, 1979). They further explained that in rural areas power is consumed only for three ways – I) domestic consumption which includes cooking and lightening; ii) industrial consumption it includes micro, small, medium enterprises, and big industries, and iii) farm consumption include energy consumption for farming. But in my field work it was found that people are mainly using fire-wood for cooking and using electricity illegally for lighting their houses. There is no concept of micro, small and medium and large industries in rural areas of Rourkela for which they need electricity. People in rural areas are using very low type energy like fuel-wood, charcoal and are unable to even buy kerosene. In agricultural work, they are dependent on traditional mode of farming and do not use modern technology. They are also dependent on seasonal rainfall rather than irrigation for water supply. Moreover, one of the main reasons for not using electricity in farming is because they can't afford to pay the electricity bill owing to their low income. Whatever meagre amount they earned is spend to meet the basic requirements of the family.

Joy Drunkenly, Gunnar Knapp and SandarGlatt (1981) made a study on "factors affecting the consumption of energy use in developing country." They explained that when income raises agriculture sector and industrial sector get more mechanized resulting to the growth of urban population and they use more electrical devices which gave rise to increase in demand of electricity. They also stated that in 1973 around 11 percent of primary electricity was used. From my field study it was found that in urban areas when income increases the demand for electricity do not rise because they already have all the electrical devices. Thus, the increase

in income do not necessarily increase any use of electrical devices, hence the consumption of electricity do not increase when the income of household rises though only negligibly. However, in the case of rural areas when income increases they used to buy electrical devices like cooler, fan, TV, cell phone and their demand of electricity also increases.

Shabidur R. Khandker, Douglas F. Barnes and Hussain A. Samad (2010) made a study on "Energy poverty in rural and urban India." They found out that the pattern of electricity consumption changes when there is change in income level. This is because high percent of electricity change when there is change in income. From my field study it was found that in rural areas when income increases their consumption of electricity also increases but this is not so much the case in urban areas.

Neither Hussain Ali Bekhet, Nor Salwati BT Othman (2012) studied on "Assessing the elasticity of electricity consumption in rural area and urban areas of Malaysia." They explained that consumption of electricity increases because due to tariff and GDP. From my field it was found that even tariff increase or decrease or GDP increase but the income level of poor people is not increasing so their consumption pattern of electricity is low.

Jiahua Pan (2002) studied the "rural energy patterns in china." He explain that commercial energy consumption by rural is disproportionately lower than that of their urban counterparts. Wide variation in energy consumption by rural and urban people is due to difference in income, access to energy use, local economy and climatic condition. There are significant variations in rural energy consumption. The reasons behind the variations are attributable to a number of reasons, but mainly to policy discrimination, low income, and high cost of commercial energy. Improvement in energy efficiency and environmental considerations particularly in rural areas, household energy consumption has been largely reliant on non commercial traditional biological matters such a crop residues, fuel wood, and biogas.

Muhammad AbulFoysal et al, (2012) made a case study on "Household consumption pattern areas of Bangladesh." They explained that energy is the important determinant of the quality of life in human settlements. They have explained revealed that households use fire wood, cow dung, leaves and twigs, branches, straw and rice husk as biomass energy mainly for cooking is 98.3 percent. This study is helpful to formulate polices support tools to take into account the future challenges for demand fuel resources, their sustainable utilization, promotion, and development. Half of the world population live in rural areas, which depend

mostly on biomass for their energy supply and have no access to modern form of energy (Demirbas&Demirbas 2007).

In many developing countries like Nepal and Bangladesh, the rural household energy consumption constitutes over 70 percent to the national energy use (ADB, 1998; Koopmans, 2005). The use of energy varies between rural and urban population, between high and low income groups with in a country. Energy use variations not only subsists in rural and urban regions, but also varied in lower and higher earner groups, between national and international levels (Pachuari 2004).

According to UNDP and World Bank estimates on investigations in 15 LCDs, household energy consumption accounts for 30-95% compared with 25-30% in developed countries. Ouedraogo (2006) for Africa, Rao& Reddy (2007) and Pachuari (2004) for India states that the inertia of the household energy preferences and consumption pattern are due to some factors such as economic condition household size, sex, age distribution of the household members, age of holdings, nature of the occupations, low living standard, education attainment of the principal wage earner and of the family members and high frequency of cooking certain meals.

PreetiMalhotra, HRehman, PreetyBhanadri, Ronnie Khanna, RituUpreti (2000) "rural energy data sources and estimation in India" they have explained that mainly in rural areas fuel wood is used for cooking meals. Petroleum and kerosene are less use than two percent of the total energy consumption in the rural areas. In rural India kerosene is mainly used in lighting. According to 50^{th} round of NSS (NSSO 1996) around 26 percent of the rural households used kerosene primarily for lighting. Only two percent of rural household use kerosene primarily for cooking fuel. In term of extension of grid electricity to the rural areas, the rural electrification programme, which is the largest rural energy programme today, claims to have electrified more than 85 percent of the 58000 villages in the country (CEA 1996).

According to Shweta Singh and UshaBajpai, access to energy is energy is an important prerequisite for a nation development in India where 70 percent live in rural areas (Census 2001). So they have suggested that renewable energy and to use these is an efficient form for the benefit of the people. There are 105293 villages yet to be electrified (MOP, 2008) lack of electricity is one of the main hurdles in the development of rural India. This paper discuss energy need of rural sector from the off grid decentralization power generation sources such

as solar and biomass and government efforts in promoting rural energy. The energy use pattern of rural India is characterized by a reliance on non commercial fuels (fuel wood, dung cake, agriculture residue) low levels of energy services, energy shortages. The main source of energy required to residential- cooking, lighting, cooling, entertainment, (b) agricultural (c) industrial / commercial (d) transport.

Richard Woodbridge, Mohit Sharma and David Fuentes(2011) "atlas of household energy consumption and expenditure in India "visualizing household energy data across India based on the 2004-2005 national sample survey (61st round). Primary fuel use patterns for cooking and lighting. Primary fuel use patterns for cooking and lighting fuel consist of 10 options (coke air coal, fire wood, LPG, gobar gas, dung cake, charcoal, kerosene, other oil, gas, candle, electricity). Both the primary cooking and lighting fuel categories were condensed to show only the most common fuel types. It was explain household fuel use, total monthly expenditure on fuel and lights, average monthly per expenditure on fuel and lights. Fuel expenditure by monthly per capita expenditure (MPCE) quartiles covers quartile wise average for MPCE on fuel and light.

"Residential consumption of electricity in India" a documentation of data methodology by World Bank (2008) stated that currently, lighting accounts for approximately 30 percent of total residential electricity use followed by refrigerators, fans, electric water heaters and TV, particularly of refrigerators and air conditioning units is expected to be main driver for the growth of residential energy demand by 2020 (Mckinsey Global Institute 2007). Household electricity usage grows because of declining household size; this means that income elasticity is even smaller when household are taken as consuming units.

In an article "determinants of cooking energy demand in the rural household of Enugu state, Nigeria: an application of the Bivariate Probit Model (2011)" Hertberg and bacon (2003) explained that access to infrastructure as the major determinant of energy consumption patterns of household. The major determinants energy demand in rural house are consumption pattern, household size, technology, household population, household structure, employment level, household income, environment factors, and energy cost.Manabu Honda, Junko Shindo, Kastuo Okamoto, and Hiroyuki Kawashima (2006) study explains that the residential electricity consumption is increasing is due to increasing rapidly in response to recent economic growth. Incomes of urban people are increasing as compare to rural people. Due to increase in population also consumption of electricity increases. In china people are

using air conditioner. In 2000 around 731kwh/y electricity was used but it was expected that by 2020 it may increase to 1,106[kwh/y].

National productivity council (NPC) energy management group state wise electricity consumption and conservation potential in India for bureau of energy efficiency (BEE) ministry of power, government of India. This study focused only on estimation of the total electricity consumption and saving potential in following sectors of each state 1. Agricultural pumping 2. Municipal water and sewage Pumping Street light 3. Commercial building like hotel, hospitals, shopping, office, Public Park having connected load of more than 500kw. The domestic sector electricity consumption varies with respect to rural and urban segments and climatic seasonal variations. In the rural segment and major use of electricity is towards lights and fan in urban segment major use of electricity towards AC and refrigeration, light, fans, TV, washing machine.Brian C.O Neill, XiaolinRen, Leiwen Jiang, Michael Dalton "the effect of urbanization on energy use in India and china in IPETS model (2012)" in this study it was explain that due to rise in urbanization demand for electricity increases in both china and India. Due to urbanization increases in electricity consumption and decreases in tradition fuel it's due to in income level of people.

A World Bank, Development Research Group (2010) study on "energy poverty in rural and urban India" used the term energy poverty. This paper proposes an alternative measure that is based on energy demand. The energy poverty line is defined as the threshold point at which energy consumption begins to rise with increase in household income. The findings suggested that in rural areas some 57 percent of household are energy poor, versus 22percent that are income poor. This paper aims to deepen our understanding of energy as one factor that underpins both economic development and poverty reduction by an analysing the relationship between energy and poverty India. This paper also explained energy consumption increases with economic growth.

2.1 AN OVERVIEW OF ELECTRICITY CONSUMPTION IN INDIA

India had experienced an illustrious 100 years of hydro power development in 1997. During that time, there were around 225 hydroelectric power stations (excluding mini hydro) in the country, with an installed capacity of about 23,500 MW, and generating about 80 billion units a year. By the turn of the century, the installed hydro power capacity rose to about 25,000 MW. This was about 25 per cent of the total installed capacity from all sources. In wind

power, India ranked fourth in the World with installed capacity of 1025 MW, after Germany, USA and Denmark.

It is estimated that India would need a total installed capacity of 212000 MW by 2012 (**Eleventh National Power Survey**). The earlier estimate was higher at 240000 MW. According to the 17th Power Survey completed in 2007, energy consumption in the country would jump from 362799 Gwh in 2003-04 to 755847 Gwh in 2011-12. In present, India had installed capacity of 214.630 Gwh as of February 2013 she is the world fifth largest with a 31.5 Gwh generated by captive power plant, 87.55% installed capacity non renewable power plant and 12.245 renewable.

'INDIA ELECTRICITY 2013', International Exhibitions and Conference, listed to be held from JANUARY 16-18, 2013 at PragatiMaidan, New Delhi, India will be the seventh event of the series since the year 2006. The event provides immense opportunity in the generation of rural electrification of growing India power sector. The event has been actively supported by central power sector utilities, IPPs, tools suppliers, technology provides, power traders, research and consult organizations among others, representing Indian and international power sectors, In addition, many states have participated in the event as associate States (*Indian Electricity 2013*).

In socio political development efforts most of developing countries introduced various policies for rural electrification in order to develop their standard. As we know there is high range of economic inequality between rural and urban populations. In order to remove this rural and urban disparities government provided electricity access to all isolated populations. The main of government is to improve the living condition of rural population and help them economically by providing financial help to them. Government introduced long term financial investment which are required to accelerate the pace of rural electrification but it require efficient implementation of these programmes is highly essential. Both private and government involvement is highly necessary.

CHAPTER THREE

DATA ANALYSIS

In this present study around six rural villages and urban areas of Rourkela been selected for data collection. Related data were collected by interviewing rural and urban people. These data are highly beneficial to my study. In this study in order to provide clear understanding SPSS analysis have been used for interpretation of my data. In this study comparison between rural and urban is been made in order to provide brief and clear understanding.

From urban and rural areas it was found that mainly women are maintaining the household and almost all people of rural areas are daily wage earner and they are earning hardly 3000 to 6000 per month and 4 to 5 persons are working in steel plant and their economic condition is very good and hardly 3 to 4 people are business man their economic condition is also good. But from my analysis and data it was found that in rural area people are using illegal electricity. In urban area almost all people minimum income is 30000 thousand and maximum is 60000 thousand per month. Urban area people are mainly using electric heater and hardly LPG for cooking were as in rural area mainly people are using wood, charcoal for cooking.

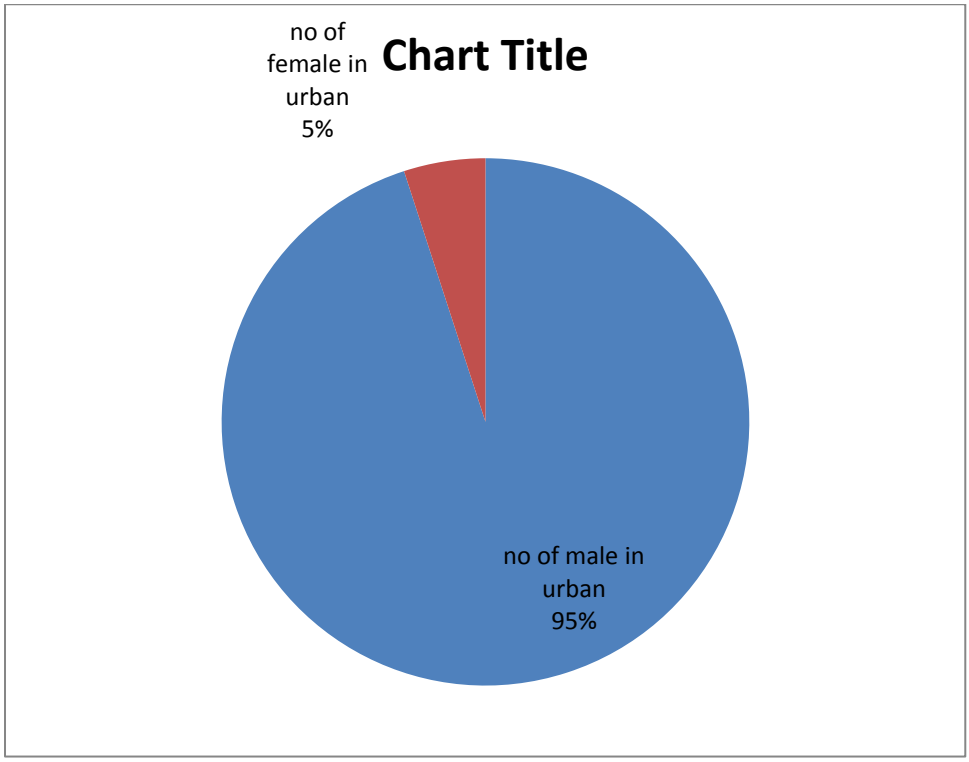
In urban area the consumption of electricity is much higher than rural area. But if we compare between rural and urban than in urban area mainly people are using two electric heaters for cooking food were as in rural area people are not able to get electricity in order to light their house at night. In private area like Chend and Koelnagar of Rourkela people are using CFL bulbs and LPG for cooking food but still they are paying 500 to 700 electrical bills per month. In cheap type quarters those who buy the SAIL houses they are also paying 500 to 800 electrical bills per month. So it was clear from my field findings that those people are working in SAIL they are attain more profit because they are getting electricity at subsidized rate. Poor people like from past history suffer still today they are suffering.

The following section indicates the total number of male and female of rural and urban areas from where data was collected.

TABLE 1: DATA COLLECTED FROM URBAN AREA

Total number of male in urban area	95
Total number of female in urban area	5

1.1: pie chart representation data collected from urban area

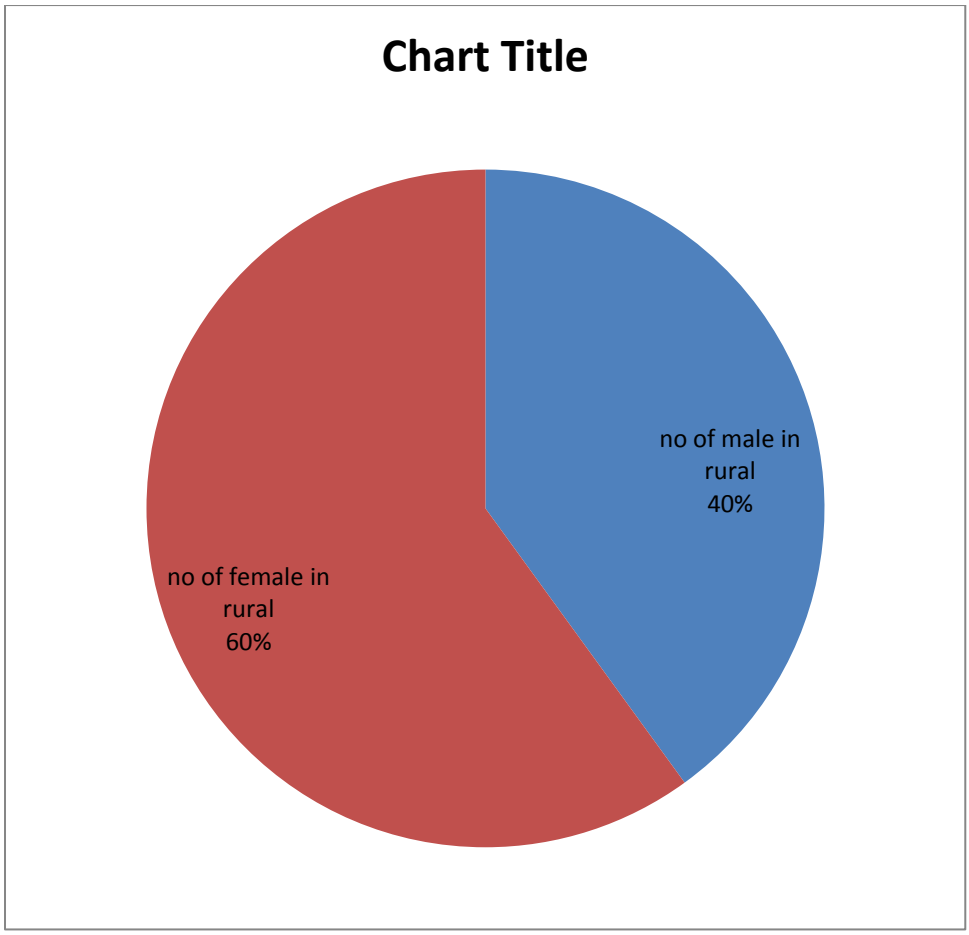


From the above table and pie chart it is clear that data were collected from mainly from male and women of urban area are not aware about how much electrical bill they are paying per month. Men are more maintain the household standard of living and women of urban areas were using two heaters in single household for cooking food. Because even they are using more or less electricity for their daily needs or enjoyment all household are paying same electrical bill, so it was find that women of urban area are less conscious of electricity. In urban area about 5% women are able to answer my questions regarding electrical bill and about their monthly income and about 95 percent male are aware about the electrical expenditure.

TABLE 2: DATA COLLECTED FROM RURAL AREA

Total number of male in rural area	40
Total number of female in rural area	60

2.1: pie chart representation data collected from rural area



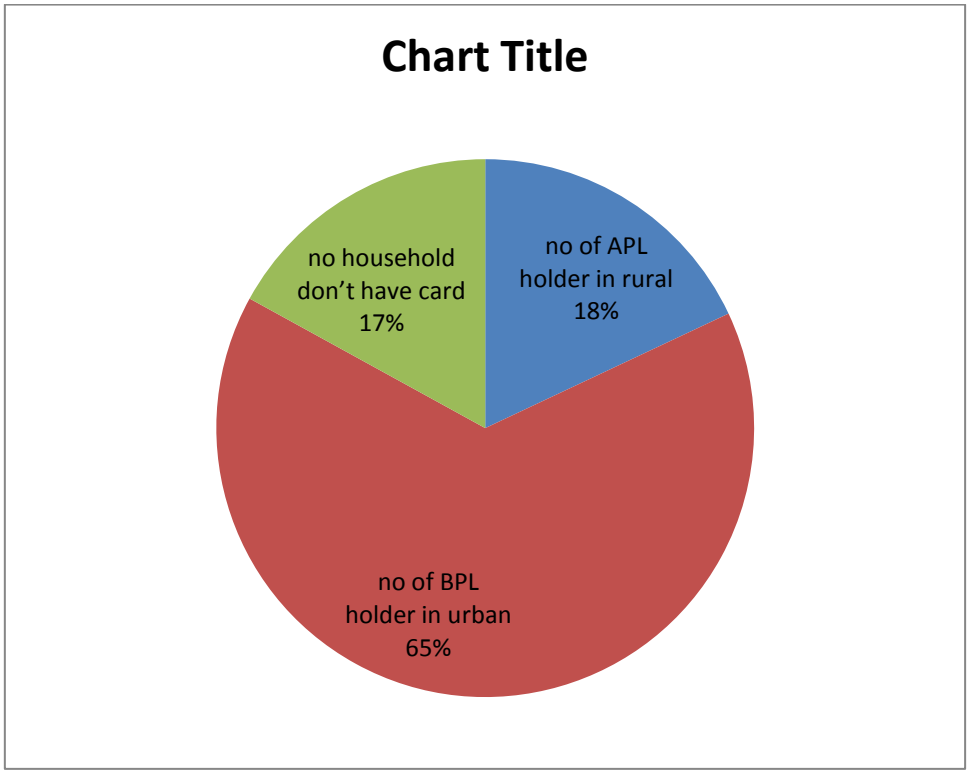
From this table and pie chart it is obvious that rural women are much more aware about electrical bill and they maintain their standard of living, it was clearly found from above table that 60 % women are given data related to their monthly income and monthly electrical bill. In rural area men are daily wage earner and they are able to earn hardly 3000 to 5000 per month and half of their income they spend on drinking alcohol. Women of

rural area are the real people who use to maintain livelihood. Rural women are more capable than urban women, urban women are mainly house wife but in rural area women are also working and maintain their household. From this above pie chart it was found that about 60 percent of women were about electrical expenditure and only 40 percent male are aware about electrical expenditure.

TABLE 3: NUMBER ABOVE POVERTY LINE (APL) AND BELOW POVERTY LINE (BPL) CARD HOLDER IN RURAL AREA

Total number of APL holder in rural area	18
Total number of BPL holder in urban area	65
Total number of people who don't have card	17

3.1: pie chart determines number of APL, BPL holder in rural areas.

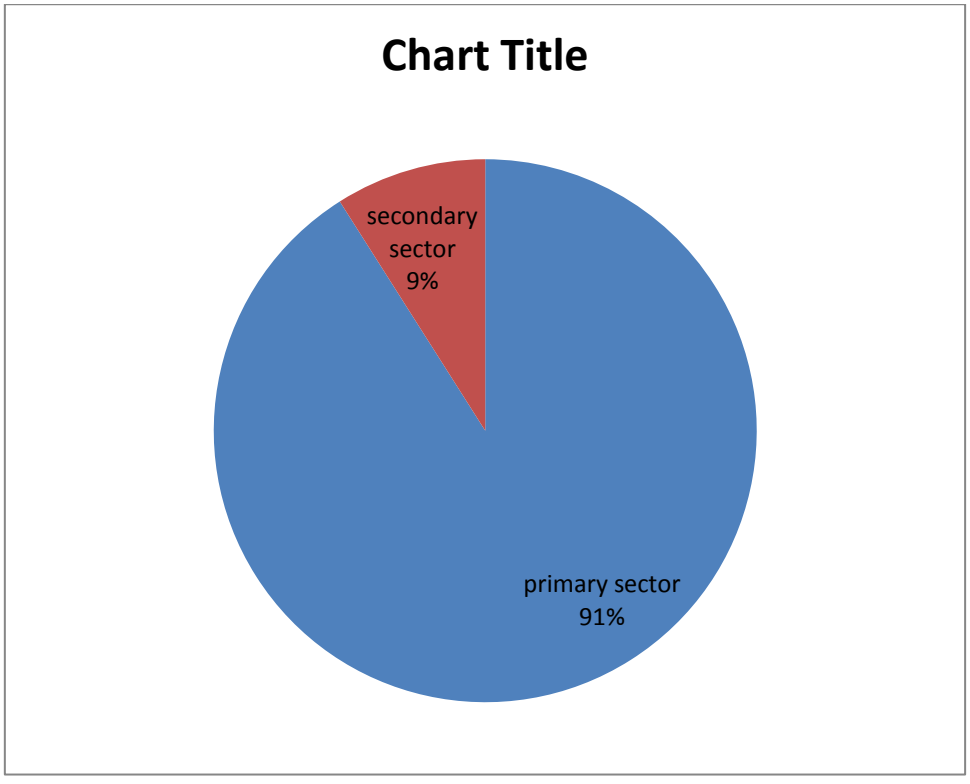


From this table and pie chart it is evident that the rural area people do not have BPL card but they have APL card with them. They are many poor people who don't have APL as well BPL card. In rural areas the most suffering people are those who don't have APL and BPL card but also their income are very low that they are not able maintain their family needs so it is very difficult for them to pay electrical bill so they illegal use electricity by hooking. From this above pie chart it make clear and explain that 17 percent of rural people don't have neither APL or BPL card, 65 percent rural people have BPL cards and 18 percent rural people have APL cards.

TABLE 4: NATURE OF EMPLOYMENT IN URBAN AREA

Number of people are engaged in primary sector	91
Number of people are engaged in secondary sector	9

4.1: Pie chart determines number of persons working in primary and secondary sector in urban areas.

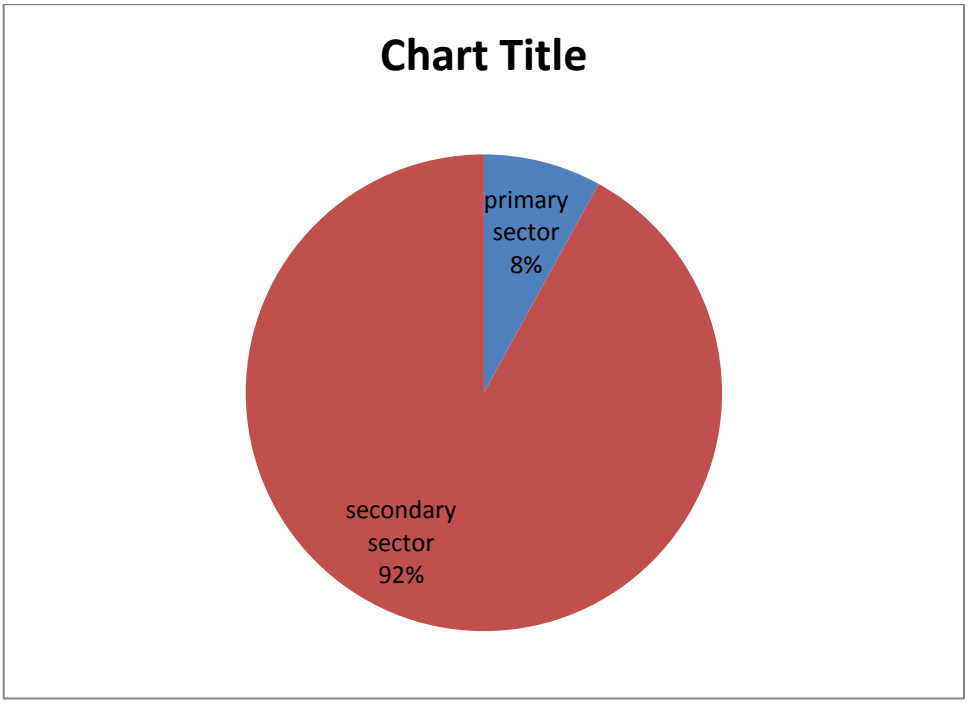


As 100 samples were taken from urban area out of which it was found that 91 persons were engaged in primary sector ex- in SAIL, other government sectors, other 9 persons were engaged in secondary sector ex- business, teacher, and contractor. Those people who were engaged in secondary sector are paying high amount of electricity as compare to those persons who were engaged in government sector. Out of 91 there are many people who have buy SAIL quarters and they are also paying high amount of electricity. From this pie chart we can found that 91 percent people are working in primary sector and only 9 percent people are engaged in secondary sector.

TABLE 5: NATURE OF EMPLOYMENT IN RURAL AREA

Number of people engaged in primary sector	8
Number of people engaged in secondary sector	92

5.1: Pie chart determines number of persons working in primary and secondary sector in rural areas.

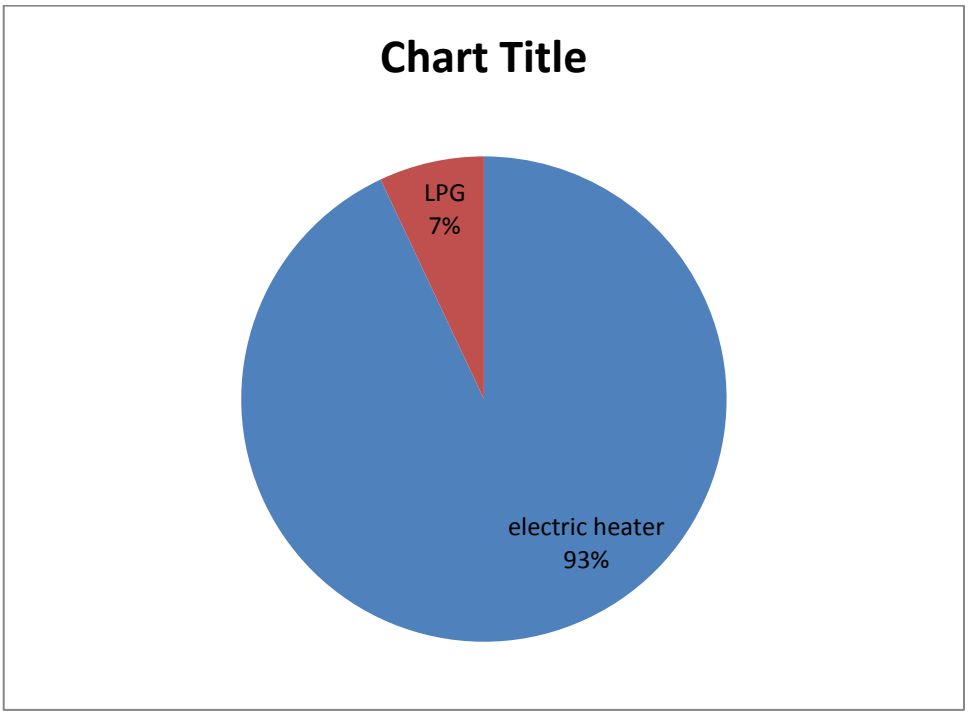


This table and pie chart indicates that people in rural areas are engaged into secondary sector. Out of 100 samples it was found that around 92 persons were engaged in secondary sector ex- daily wage earner, mechanic, farmers and only 8 persons were engaged in primary sector ex-SAIL employee, railway service. Those who were engaged in government service they are able to earn good amount of salary as compare to persons who were engaged in secondary sector. These 8 persons are able to take electricity and others are using electricity but illegal (hooking), because they are unable to pay electricity bill. From this above pie chart it was clear that in rural area only 8 percent people are engaged in primary sector and about 92 percent people were engaged in secondary sectors.

TABLE 6: COOKING FUEL USED IN URBAN AREA

Electric heater	93
LPG	7

6.1: pie chart determines cooking fuel used in urban area

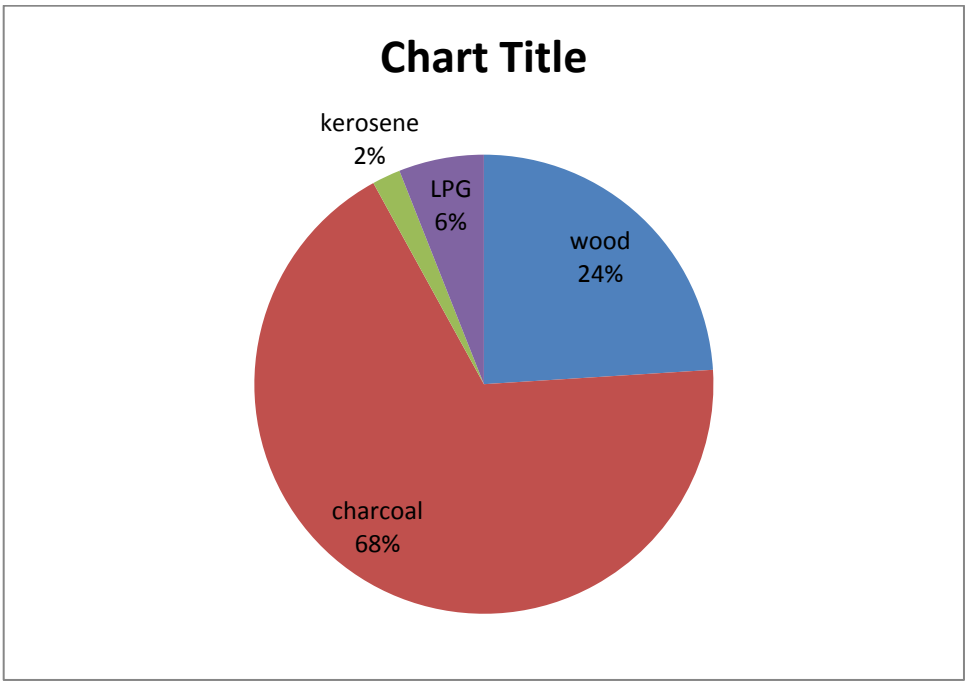


My field study data indicates that about 93 household were using electric heater for cooking food were as only 7 people were only using LPG for cooking food. Those who were using LPG are from non government sector. From in above chart it was clear that in urban area around 7 percent household are using LPG for cooking and 93 percent household are using electrical heaters. So it was clear that in urban area people are using more electricity for cooking food were as in rural areas people are suffering a lot.

TABLE 7: COOKING FUEL USED IN RURAL AREA

wood	24
charcoal	68
kerosene	2
LPG	6

7.1: pie chart determines cooking fuel used in rural area



In rural area, it was found that 24 households are using wood for cooking, 68 household are using charcoal for cooking, 2 household are using kerosene for cooking and 6 household are using LPG for cooking food. From this above pie chart it was clear that in rural area 68 percent household use charcoal, 24 percent household use wood, 6percent household use LPG and 2 percent household use kerosene for cooking.

TABLE 8: NUMBER OF HOUSEHOLD USING ELECTRICITY IN URBAN AREA

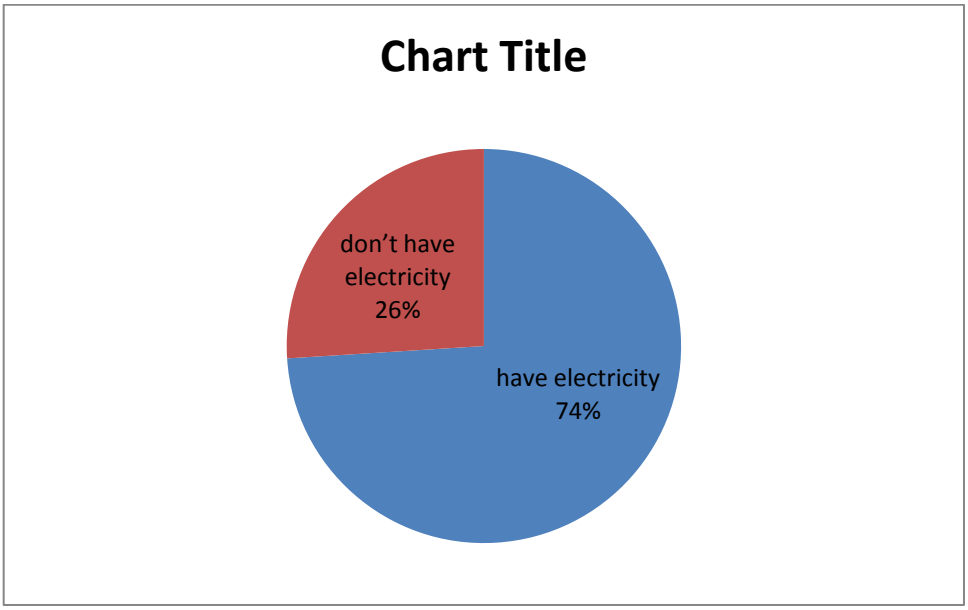
Have electricity	100

Note: In urban area out of 100 percent of the households is using electricity.

TABLE 9: NUMBER OF HOUSEHOLD USING ELECTRICITY IN RURAL AREA

Using electricity	74
Not using electricity	26

9.1: pie chart determines number of household using electricity in rural area.



Note: In rural area, out of 100 household 74 percent household have electricity and 26 percent household do NOT have electricity.

TABLE 10: HOUSEHOLD WITH METER READING BOARD – URBAN AREA

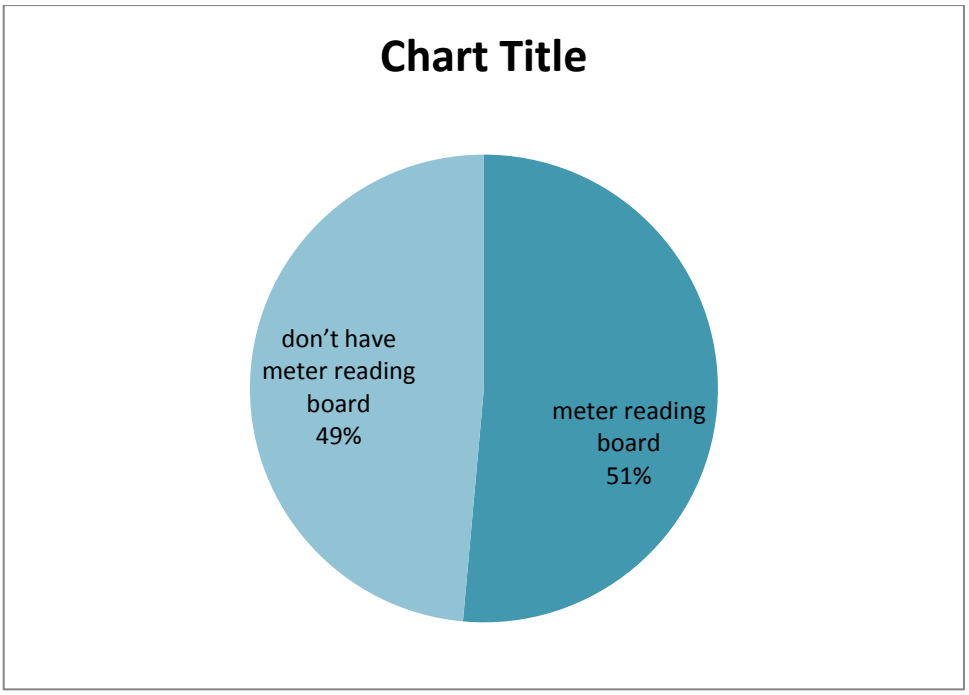
Households with electric meter board	100

Note: In urban area, each household have electric meter board.

TABLE 11: HOUSEHOLD WITH AND WITHOUT METER READING BOARD – RURAL AREA

Households with meter reading board	51
Households without meter reading board	49

11.1: pie chart determines number of household with and without meter reading board-rural area

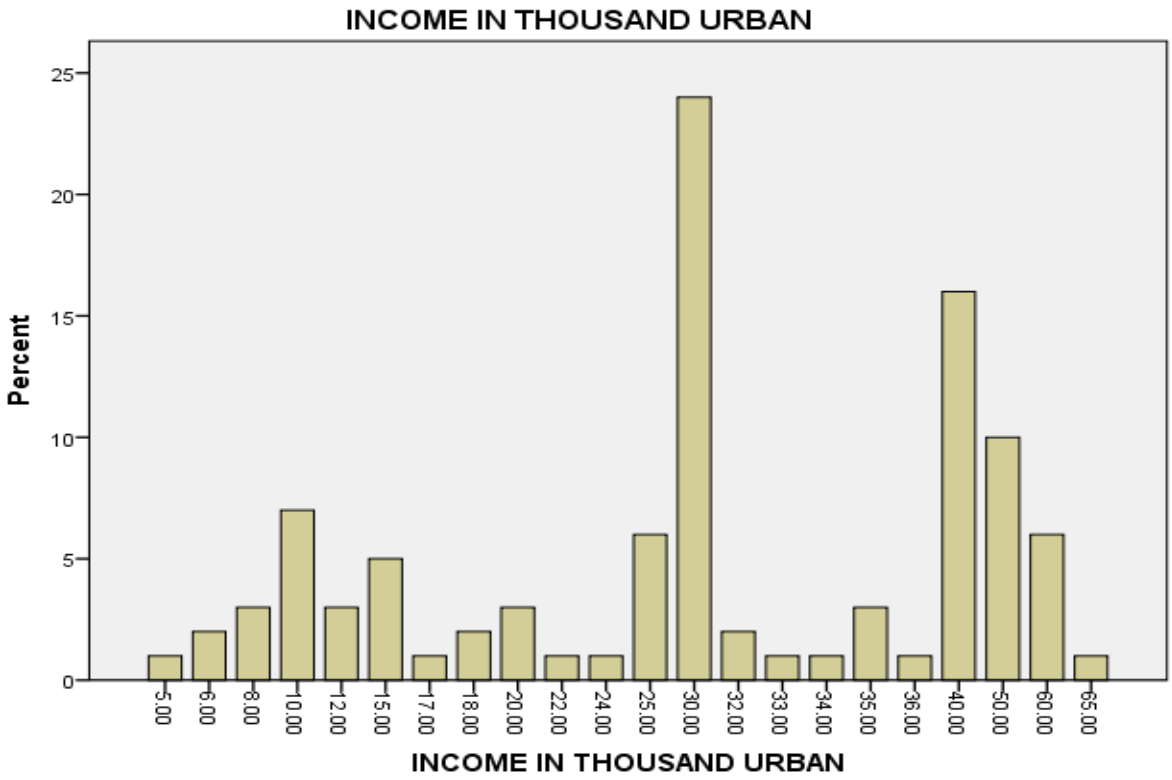


In rural area, out of 100 household only 51 percent household have meter reading board and 49 percent household don't have meter reading board. Interestingly household have

meter reading board but no electricity connection or power supply and still no current supply.

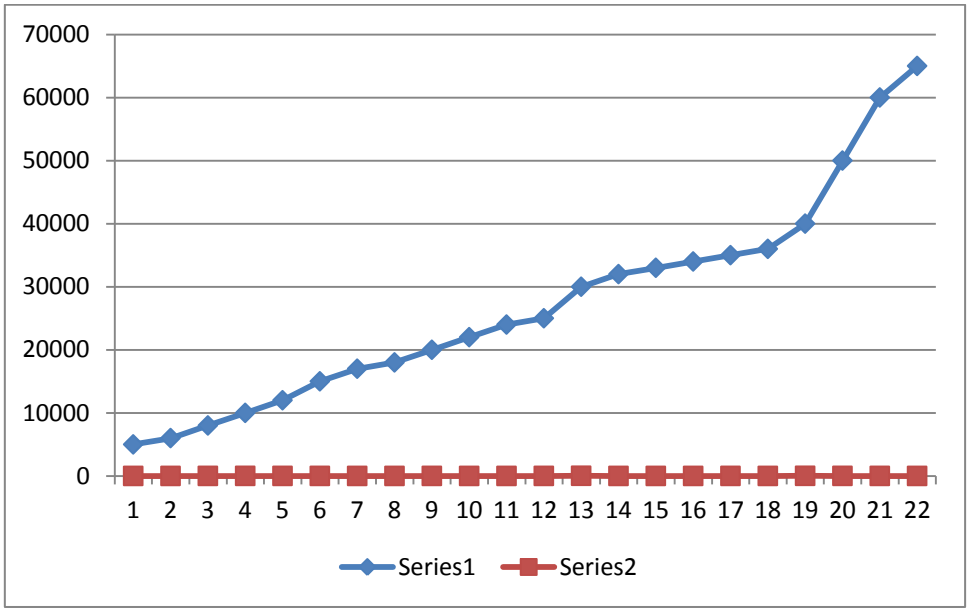
TABLE 12: MONTHLY INCOME – HEAD OF THE HOUSEHOLD: URBAN

Income in thousand	Number of peoples
5000	1
6000	2
8000	3
10000	7
12000	3
15000	5
17000	1
18000	2
20000	3
22000	1
24000	1
25000	6
30000	24
32000	2
33000	1
34000	1
35000	3
36000	1
40000	16
50000	10
60000	6
65000	1



Note: As indicated in the above chart, the number of households having a monthly income of Rs. 30,000/- is the highest.

(Graphical representation related income of urban area)



This pie chart shows maximum income level and minimum income level of urban area.

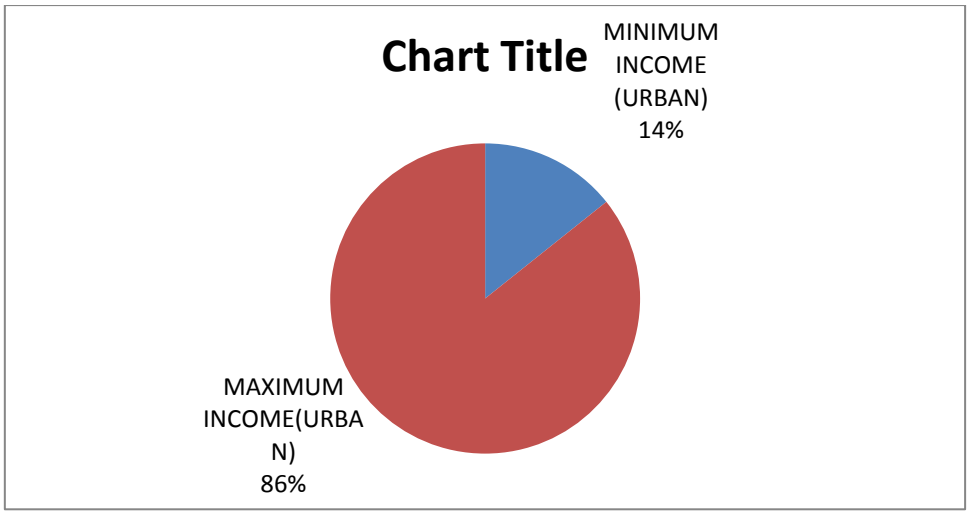
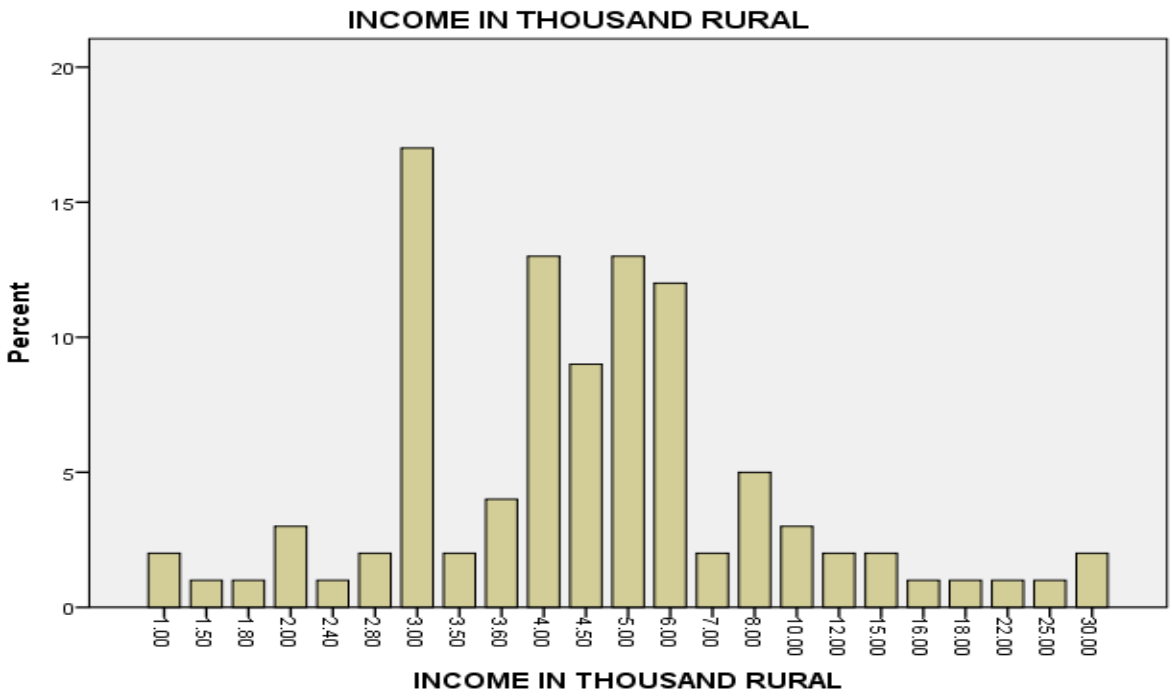


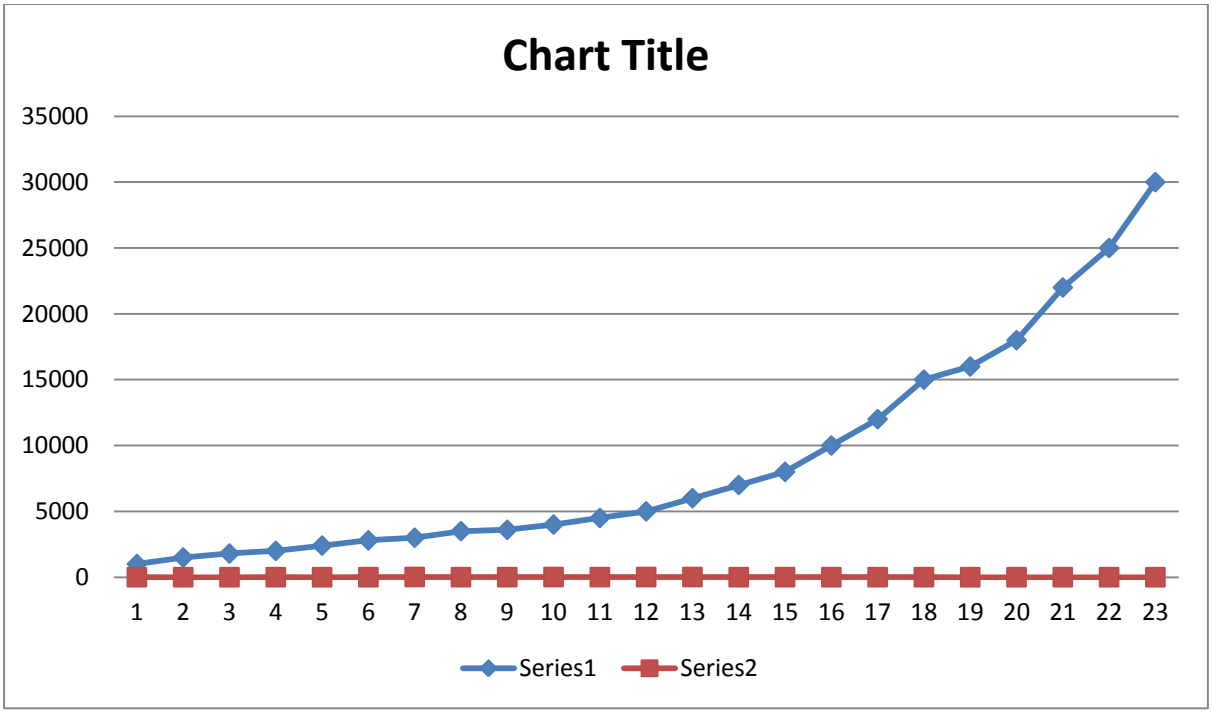
TABLE 13: MONTHLY INCOME – HEAD OF THE HOUSEHOLD: RURAL

Income in thousand	Number of peoples
1000	2
1500	1
1800	1
2000	3
2400	1
2800	2
3000	17
3500	2
3600	9
4000	13
4500	9
5000	13
6000	12
7000	2
8000	5
1000	3
12000	2
15000	2
16000	1
18000	1
22000	1
25000	1
30000	2



As I have discussed earlier, the rural people are mainly engaged in secondary or unorganised sector, such as daily wage labour – this graph clearly indicates that maximum rural households' monthly income is Rs. 3000.

(Chart related to income earned in rural area)



This pie chart shows maximum income level and minimum income level of rural area.

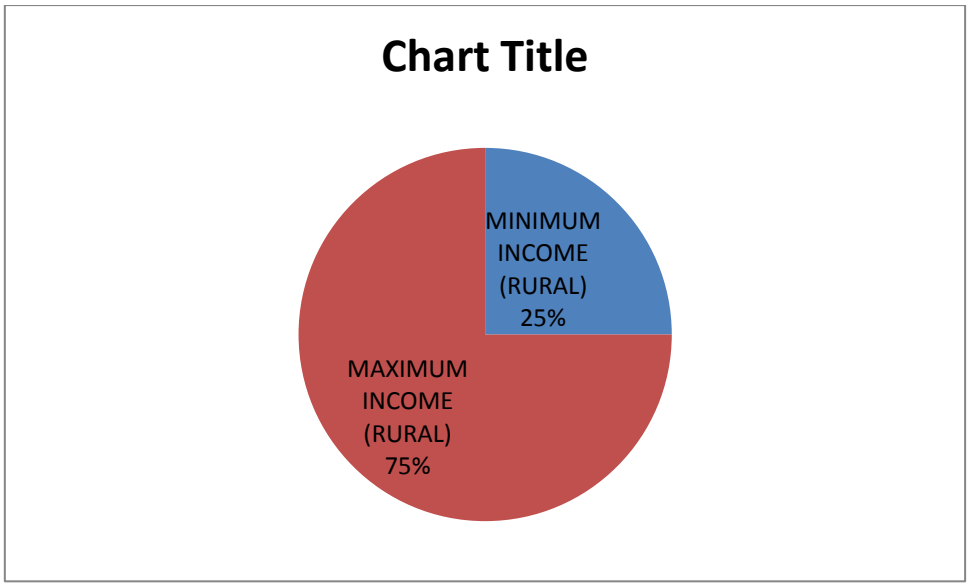
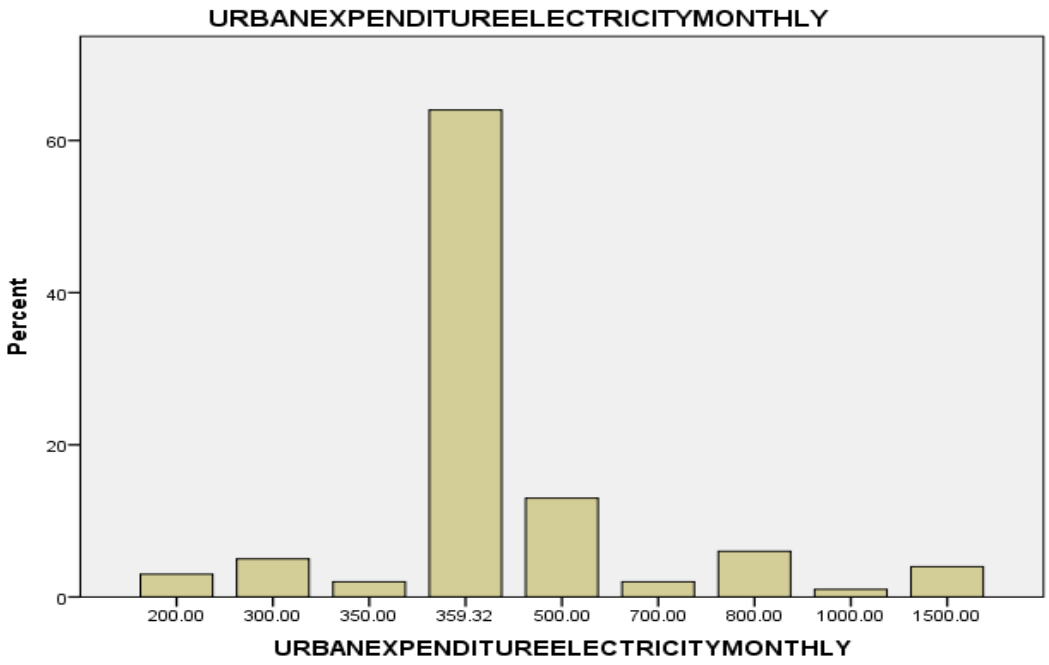


TABLE 14: MONTHLY EXPENDITURE ON ELECTRICITY – URBAN

Monthly expenditure on electricity	Number of household
200	3
300	5
350	2
359.32	64
500	13
700	2
800	6
1000	1
1500	4



From this above it was clear that 359.32 is highest and 700 is lowest. Mainly people who were SAIL employee even they use more electricity each household pay 359.32 even a single household use two electric heater as compare to a household who use one electric heater for cooking. Mainly those people who were living in cheap type SAIL quarters and have buy the houses they used to pay 200, 300, 350, 500, and 700. Mainly those people who were living in Koelnagar and Chend area of Rourkela they Rs. 800, 700, 1000, and 1500.

(Related graph urban expenditure on electricity)

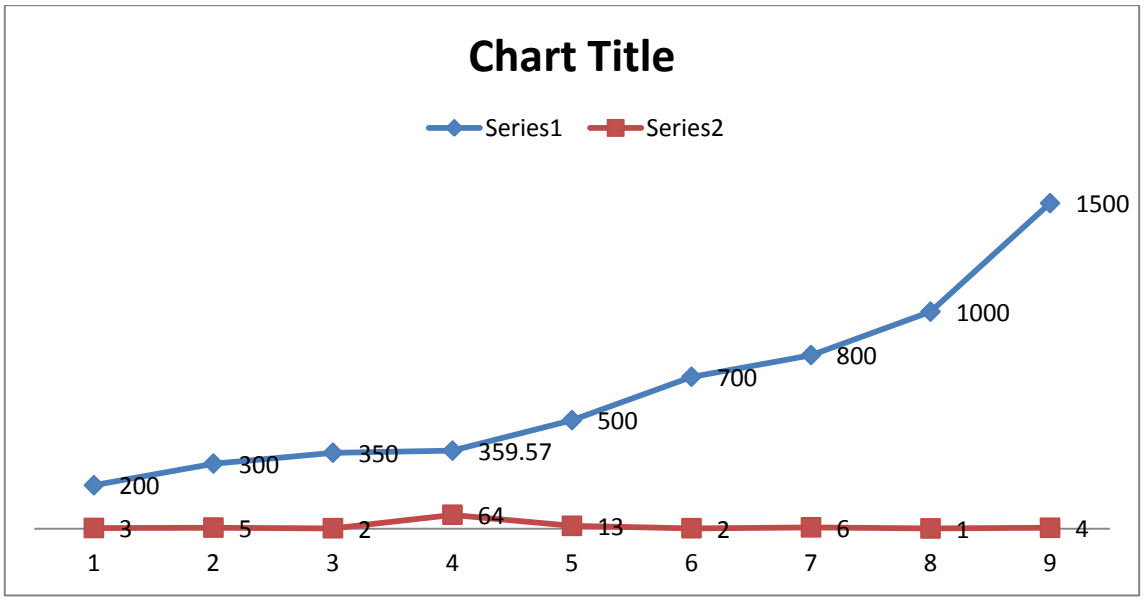
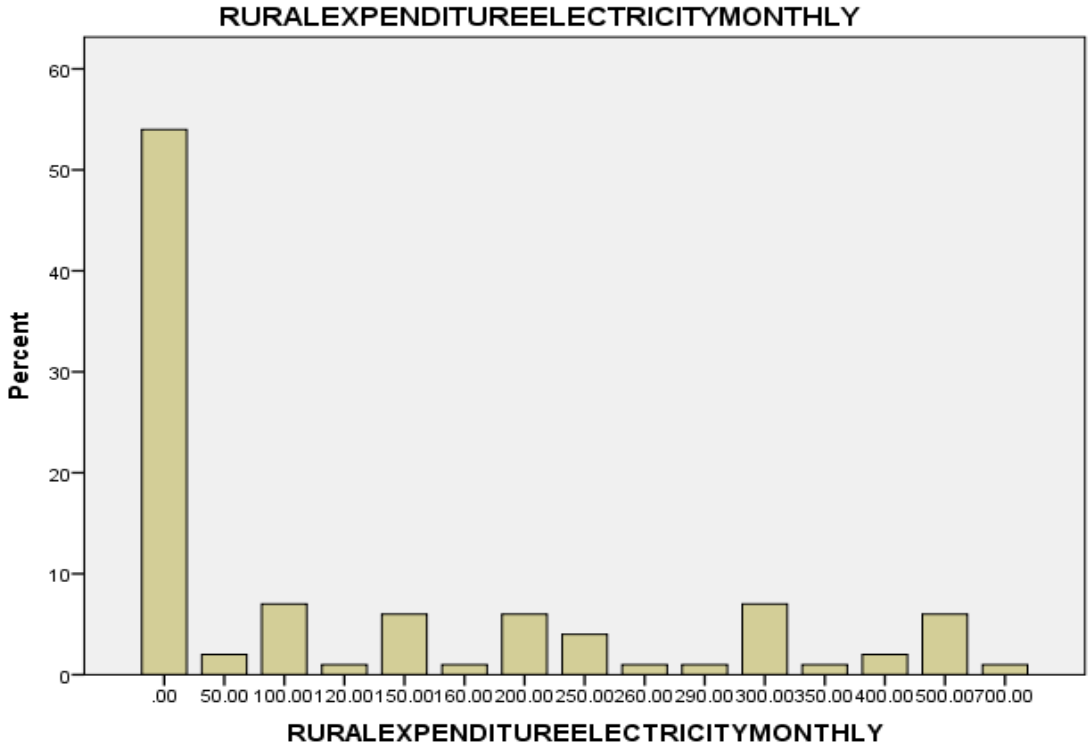
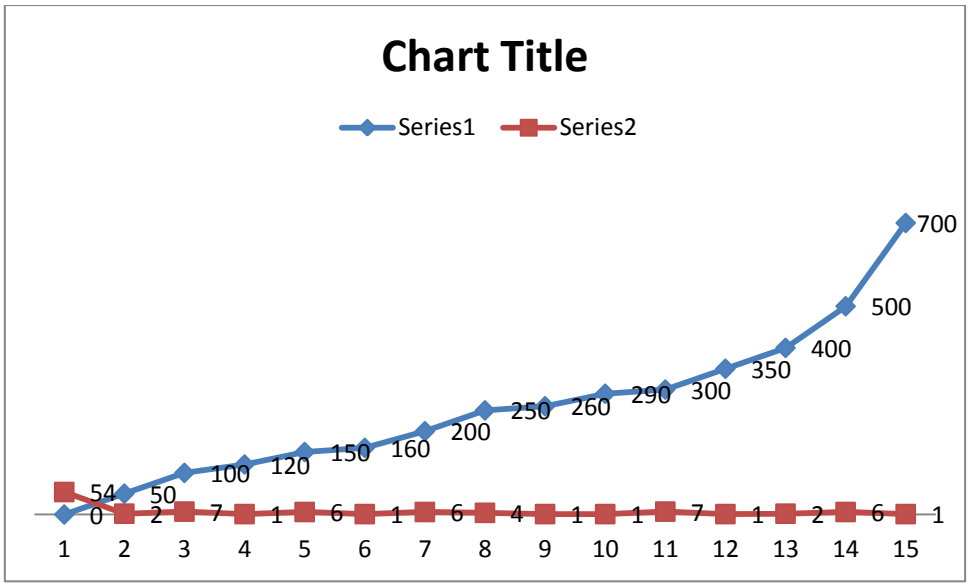


TABLE 15: MONTHLY EXPENDITURE ON ELECTRICITY – RURAL

Monthly expenditure on electricity	Number of household
00	54
50	2
100	7
120	1
150	6
160	1
200	6
250	4
260	1
290	1
300	7
350	1
400	2
500	6
700	1



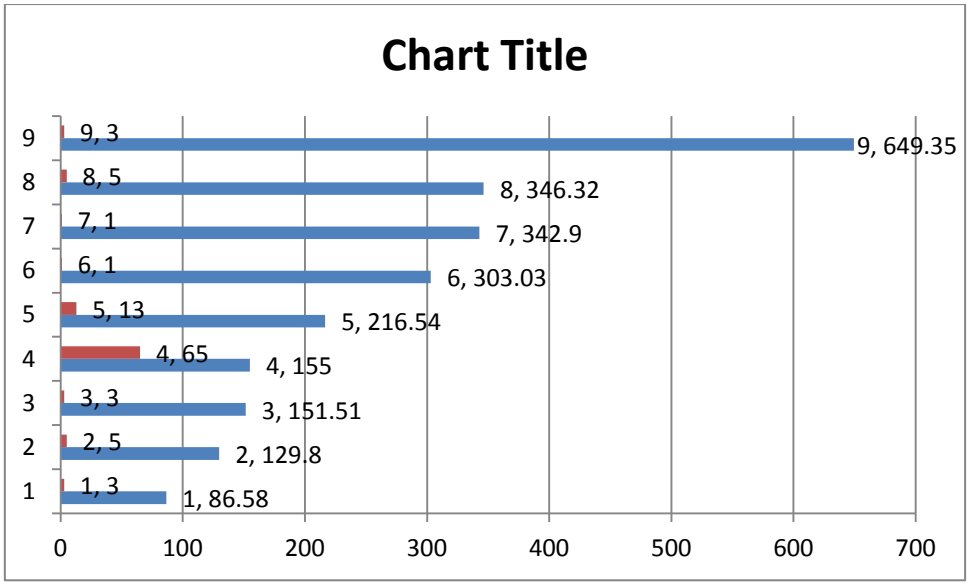
(Related graph urban expenditure on electricity)



In rural areas, maximum people don't have electricity at their home and they use to use electricity in a illegal way. From this graph it was clear that highest percent of rural people are not paying any electricity fee. Those people who bring electricity from other household they used to pay rs100, Rs 50. Those people who haven't taken electricity in legal way they used to pay 300, 350,700, and 250 per month.

TABLE 16: TOTAL UNITS OF ELECTRICITY CONSUMED IN URBAN AREA PER MONTH

Total units consumed per month	Number of household
86.58	3
129.80	5
151.51	3
155.00	65
216.45	13
303.03	1
342.90	1
346.32	5
649.35	3
649.45	1
649.45	1



This above table and graph chart clearly explains that maximum 155 units are consumed by urban household is for those people who were working in Rourkela steel plant, then 216.45 units are been consumed, then 346.90 units were consumed, then 129.80 units were consumed. Lowest electricity units were consumed in urban areas is 303.03 units, 342.90 units, 649.45 units.

3.1 KEY FINDINGS OF THE STUDY

From my field study and based on the data I have collected the following points can be highlighted. These are as follows:

- Mainly in rural areas people are very poor and their income is hardly 90 and 120 per day and their monthly income is between rs3000 to 5000. They are mainly daily wage earner. Some people are even not able to satisfy their family income due to low income. Many rural not only working as daily wage earner but when they are not getting any kind of work they used to work in agriculture field.
- In rural mostly they have joint family including 12 to 13 member in a single household so it is not possible to maintain the standard of living because their income is low, when they are not able to provide food there is no chance pay electrical bill and they use electricity illegal way by hooking or they use to take electricity from those household those who have taken electricity.
- In rural area mainly people are illiterate so they are not aware about the actual price of electricity and they are cheated by the electrician people, when they used to come to take electrical bill, when poor people are not able to pay from electrical department they used to cut the electricity. In such situation people don't have any option and they use electricity through illegal way.

- There is hardly any electric meter in rural areas. Even those who have electric meter they are doing corruption and they block the reading of electric meter because it won't read the consumption of electricity used by rural people.
- Even people use electricity or not those who have electric board those people have to pay equal electrical bill even they use electricity or not. In rural area even people who have all electrical assets they pay the same amount and the person who have no electrical asset they are also paying the same electrical bill.
- In rural those people who are using electricity they mainly use 100 watt bulbs to lighting their house. They are paying Rupees 500 per month even they are not using electric heater for cooking. Their income is so low that they are unable to feed their children so they are unable to take electricity.
- It was found in rural that single household take electricity from this house five to six household take electricity and when electrical bill used to come they divide themselves and pay the electrical bill. Regular meter checking is not carried out.
- Rural people are not aware about the actual price of electricity because when electrician use to come to collect electricity bill they don't provide bill to them even they are not aware about price of per unit of electricity.
- When any problem occur due to power cut or due to not working electric meter they use to give complain to solve problem in Bisra electrical substitution but they don't get positive response and rural people solve the problem by themselves or they pay private people to solve the electrical problem.
- Poor people are not able to register their name electrical department to take electricity because during registration they have to Rs. 2000 and they are unable to pay.
- In urban area those people are staying in RSP quarters even they use more electricity or less electricity for every house hold the electrical bill is same.
- In urban in maximum household people use all kind of electrical device as compare to other household but they pay same electrical bill.
- As compare to rural people urban people income is much higher but still they pay less electrical bill as compare to rural people.
- China meter was found is every house hold but it is useless because people use more or less electricity they pay same amount of electricity.
- In private areas like Koelnagar and Chend according to their utilization of electricity they pay the electrical bill, people are more conscious about electricity they use CFL bulbs to light their house.

3.2 FACTORS DETERMINING THE CONSUMPTION OF ELECTRICITY

There are several factors which determine the consumption of electricity. Based on my field study I have come across some of the determinant factors responsible for consumption of electricity. In the following section I discuss them, which are as follows:

i) **Imbalances in Price of Electricity**: My household survey indicated that price of electricity is higher for the poor people who were living in the rural areas of Rourkela. These rural residents are unable to register their name in Electrical Department, the reason being that for registrations they need pay Rs. 2000, which is not affordable for them. The rural poor are paying a monthly electricity fee of Rs. 500. This is one of the prime factor for which they are not in a position to use electricity. However, in the case of urban people, SAIL (Steel Authority of India Ltd.) is providing electricity at a subsidized rate. Moreover, the urban residents are paying less electrical bill in compare to the rural people even though their income is higher than the rural people.

ii) **Income**: Income is also another factor which determines the consumption level of electricity in rural and urban areas of Rourkela. In rural area, the people are primarily daily wage earners who do not have regular income. They are mostly self-employed in an unorganised sector. My household survey indicates that there are hardly two or three rural households whose head of the family are working in government sector. The rural households generate a maximum of three to five thousand per month. With this meagre amount of income, they maintain their large family members which are insufficient for them. In fact, the poor people whose income only meets their day to day requirement and expenditure do not have surplus income and money to pay for using electricity.

Whereas, in the case of urban area it was found that income level is much higher than the rural people. The monthly income of the urban area begins from a minimum twenty-five thousand and goes up to more than one lakh of rupees. Among the urban residents, Koelnagarhouseholds show income higher than rest of the urban localities. Even when income is higher as comparatively to poor people so urban people are capable to pay electrical bill and they use electricity.

iii) **Size of the Household**: To some extend the size and number of residents in a household is also responsible for consumption of electricity in both rural and urban area. Here, I intend to show the demography factors related to age, family, income and number of the people in the residence. Taking the case of nuclear family in rural area and urban area – the size of family in rural area are very high. So their expenditure on family member is also very high. But in case of urban area the size of the families are small. Taking the size of the

family/household into consideration, it is evident that the expenditure of the rural people is higher. This could be one of the factors responsible for their inability to pay electricity bill or get connection.

iv) **Electricity Devices**: It is a well known fact that more use of electricity device led to more consumption of electricity. However, it was found that in rural area people income are too low that they can't afford to own any electronic devices except an electrical bulb and a fan in some households. Therefore, their consumption of electricity is very low. In urban areas, since their income is higher their living standard is higher and more luxurious. They indulge for their own satisfaction and enjoyment. Hence, they use various electronic devices for example TV, phone, music system, washing machine, AC, refrigerator, micro-oven, and computer and so on. All these goods are highly consuming high amount of electricity.

V) **Climate**: To some extent climate is also responsible for the consumption of electrification in rural and urban areas. For instance, if the climate is cold then people may consume less electricity as they will avoid using fan, cooler or an air conditioner. Whereas, if the climate is hot then people may use more electricity because due to the rising temperature they will use fan, cooler, air conditioner. Therefore, the consumption of electricity will increase during cold climatic condition. In Rourkela the climate condition during summer is very hot in both rural and urban areas. So people use more electricity because they use more electrical devices. From my field study I have experienced and attain practical knowledge by interacting with people that in winter hardly 4 to 5 units of electricity is been consumed but in summer season 8 to 7 units of electricity is been consumed by a single household. So it was clear that climate also play a vital role in determining the consumption level of electricity.

CHAPTER FOUR

CONCLUSION

This present study focuses on – the importance of electricity in both rural and urban areas and mainly its importance in the modern context; government policies on rural electrification and the benefits of electricity. One of the main objectives of my study is to analyse the determinants of changing in consumption pattern of electricity in rural and urban areas. To identify the number of household electrified in rural areas. The few significance of my study will provide immense value for gaining knowledge of future demand for consumption of electricity in both rural and urban area. This study will give description analysis how change in consumption pattern electricity is increasing in both rural and urban area. This study will provide what are the factors which are responsible for rise in consumption pattern of electricity in the present context.

Through my study few suggestions are also given for further considerations. Government officials should give utmost priority to the rural areas as many household are without electricity. One of the prerequisite at the moment is to reduce the rate of electricity registration so that the rural poor people can afford it. In rural area many BPL holders are getting free electricity but the electricity is provided to them is not sufficient. High level of voltage should be provided. In urban areas those who are using more electricity should pay more electrical bill then those household who were using less electricity. As compared to rural area in urban area people are using more electricity but they are paying nominal electricity price and rural area people are paying high amount of electricity. This kind of imbalances should be checked. Government should provide more benefits to rural people than urban people; the income level of the later is much higher.

Though my field study was for a short duration, it enables me to gain an understanding of what are the primary factors that are responsible for utilization of electricity in rural and urban areas. It will also help to determine their expenditures and identify the number of households with electricity connection in rural villages and urban areas. This study also show how in rural area people are not able to get electricity and using electricity in an illegal way without getting their names registered in the electrical department. On the other hand, there are households in urban areas mainly living in SAIL houses are paying nominal electric bill

per month. There are also households who have own their houses privately in Koelnagar and Chend paying high amount of electricity bill in compare to the SAIL quarters. In my study, it was found that both in rural and urban areas the meter reading is not check regularly.

This study will provide immense knowledge about the condition of rural people. My household survey indicates that the poor villagers were living without electricity in a grim situation. Since many of the rural area people are daily wage earner and their income is very low, they are unable to get connection and pay the bill. This leads to illegal electricity connection by hooking from electric pool. And in the case of those who have electric connectivity, they are often cheated as they are unaware about the electric meter.

To be honest, many limitations have also cropped up during my field study. Some of them are inadequate time, not possible to collect maximum data of rural villages and urban households. I will highlight this in the following section. Overall, the great advantage of this study would be to provide clear and holistic understanding regarding the pattern of electricity consumption in rural and urban areas.

SUGGESTIONS

The following modest suggestions can be particularised from my study:

- An awareness campaign should be provided to the rural people about the electrical bill and the cost of electricity per unit so that there is no malpractice on the part of the government officials in issuing electrical bills without checking the meter.
- An effort should be made from the government to provide electricity to rural people at a subsidised price so that they can afford to pay the electricity bill as well as get the registration and connection. This way the practice of illegal connection by hooking electricity from electrical pool can be avoided.
- Electrical bill should be collected regularly on a monthly basis to avoid burden of paying a lump sum amount for many months.
- In rural area many BPL holders are getting free electricity but the electricity is provided to them is insufficient, therefore a high level of voltage should be provided.
- Awareness should be created among people to use CFL bulbs instead of 100 watt bulbs because it saves energy and power.
- In urban areas those who are using more electricity should pay high electrical bill then those households who are using less electricity.

- As compared to rural area in urban area people are using more electricity but they are paying nominal or subsidised electricity price and rural area people are paying high amount of electricity. These imbalances should be checked and curbed.
- Government should provide benefit to rural people more than urban people because if we compare the income level between rural and urban area as it was found that income level is much higher in urban areas than the rural areas.

LIMITATIONS

Following are some of the limitations of my study:

- Due to inadequate duration of the study period, it is not possible to collect all the data from different villages of rural areas and urban areas. Therefore, some of the findings could be inconclusive.
- Less opportunity and time to gather extract facts and information.
- As there is gap in communication especially in rural areas, collection of data takes a longer duration.
- Rural peoples are not clear and convince about the questions hence the answers they responded are sometimes confusing and difficult to analyse and interpret.
- Urban residents sometimes give misinformation and hide the authentic data.

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ANNEXTURE-1

CASE STUDY 1: ELECTRICITY CONSUMPTION BY NON-GOVERNMENT HOUSEHOLD (OWNED BY PRIVATE INDIVIDUAL) OF URBAN AREA IN CHEND

NAME	KIRAN KUMAR MOHARANA
SEX	MALE
AGE	41
BPL/APL	APL
STATE	ODISHA
DISTRICT	SUNDERGARH
BLOCK	CHEND
VILLAGE	ROURKELA
DISTANCE FROM CAPITAL	432 KM
TOTAL NO OF FAMILY MEMBERS	8
MARITAL STATUS	MARRIED
EDUCATION QUALIFICATION	5^{TH} CLASS
NATURE OF EMPLOYMENT	BOTH HUSBAND AND WIFE ARE WORKING, HUSBAND IS IN SAIL
MONTLY INCOME	TOTAL MONTHLY INCOME OF HUSBAND IS 30000, WIFE INCOME IS 12000
YEARLY INCOME	COMBINELY TOTAL INCOME IS 510000
HOUSE TYPE	PUCCA
FAMILY TYPE	NUCLEAR
PERIOD OF HABITATION	MORE THAN 10 YEARS
SANITATION	YES
MAIN COOKING FUEL	BOTH WOOD AND GAS

MOTOR CYCLE/ SCOOTER	YES 1 MOTOR CYCLE
CAR	NO
GENERATOR	NO
PUMP SET DIESEL/ ELECTRIC	YES
DO YOU HAVE ELECTRICITY AT HOME	YES
FROM WHICH SECTOR YOU GET ELECTRICITY	PRIVATE
DO YOU ELECTRICITY METER READING BOARD	YES
COST OF PER UNIT OF ELECTRICITY	4
TOTAL UNITS CONSUMED PER MONTH	375
MONTLY EXPENDITURE ON ELECTRICITY	1500
DURATION OF POWER SUPPLY AVAILABLE PER DAY	23 HOURS
POWER CUT IS THEIR	YES
IF YES, HOW MANY HOURS POWER CUT IS DONE IN A DAY	1 HOUR
VOLTATE LEVEL	SOME TIME HIGH AND SOME TIME LOW , MEDIUM
DO YOU USE OTHER SOURCE OF ENERGY	YES
IF YES , INDICATE THE SOURCE	EMERGENCE
METER BOARD IS THERE	YES
REGULAR METER CHECKING IS DONE	YES
IF YES, HOW OFTEN METER CHECKING IS DONE	MONTLY BASIS
ELECTRIC SUBSTIUTION IS THERE	YES
WHAT HAPPEN IF ANY PROBLEM OCCUR	ELECTRICAL OFFICERS USE TO COME TO SOLVE PROBLEM
IN A DAY WHEN YOU USE ELECTRICITY	MAINLY AT NIGHT MORE ELECTRICITY IS BEEN CONSUMED
WAT OF BULBS BEEN USED	100,18,20,10,40
DO YOU SWITCH OF FANS WHEN YOU GO OUT SIDE	YES

DO YOU THINK IF INCOME INCREASES THEN CONSUMPTION OF ELECTRICITY WILL INCREASE	NO
ARE YOU AWARE HOW TO SAVE ELECTRICITY	YES
AMOUNT OF ENERGY CONSUME	1500 RS IN PETROL
WHAT MODE OF BACKK UP YOU HAVE WHEN NO ELECTRICITY	ELECTRIC DISEL

WHICH OF THE FOLLOWING ELECTRICAL APPLIANCES DO YOU USE AT PRESENT AND WHICH OTHERS ARE LIKELY TO BE USE IN FUTURE

ELECTRICAL APPLIANCES	**IN PRESENT**	**IN FUTURE**
ELECTRICAL LIGHTS	YES	
LAMPS	YES	
RADIO/MUSIC SYSTEM	YES	
T.V	YES	
COMPUTER/ LAPTOP	YES	
FAN	YES	
COOLER/ AC	YES	IF POSSIBLE THEN AC
WATER HEATER	YES	
MICRO OVEN		YES
VACCUM CLEANER		
REFRIGATOR	YES	
WASHING MACHINE		
MOBILE	YES	
SATELLITE DISH SYSTEM	YES	

Note: MAINLY PRIVATE PEOPLE ARE PAYING HIGH AMOUNT OF ELECTRICITY BILL.THERE INCOME IS VERY HIGH AND THEY HOPE THAT IF FURTHER INCOME INCREASES THEY MAY BUY ELECTRICAL APPLIANCES IN FUTURE.

ANNEXTURE-2

CASE STUDY 2 – ELECTRICITY CONSUMPTION BY SAIL AND PRIVATE PEOPLE OF URBAN AREA (THOSE WHO HAVE BOUGHT SAIL QUARTERS)

NAME	**PADHMA CHARAN PARIDA**
SEX	MALE
AGE	46
BPL/APL	APL
STATE	ODISHA
DISTRICT	SUNDERGARH
BLOCK	SECTOR 4 CHEAPTYPE QUATERS
VILLAGE	ROURKELA
DISTANCE FROM CAPITAL	380KM
TOTAL NO OF FAMILY MEMBERS	5
MARITAL STATUS	MARRIED
EDUCATION QUALIFICATION	B.A, B.ED
NATURE OF EMPLOYMENT	SECONDARY, SCHOOL TEACHER
MONTLY INCOME	18000 TO 20000
YEARLY INCOME	250000
HOUSE TYPE	PUCCA
FAMILY TYPE	NEUCLEAR
PERIOD OF HABITATION	LAST 5
SANITATION	YES
MAIN COOKING FUEL	LPG
MOTOR CYCLE/ SCOOTER	1 MOTOR CYCLE
CAR	NO
GENERATOR	NO

PUMP SET DIESEL/ ELECTRIC	NO
DO YOU HAVE ELECTRICITY AT HOME	YES
FROM WHICH SECTOR YOU GET ELECTRICITY	SAIL
DO YOU ELECTRICITY METER READING BOARD	YES
COST OF PER UNIT OF ELECTRICITY	2.31
TOTAL UNITS CONSUMED PER MONTH	356.32
MONTLY EXPENDITURE ON ELECTRICITY	800
DURATION OF POWER SUPPLY AVAILABLE PER DAY	PER DAY 23 HOURS UNTILL ANY PROBLEM OCCOUR
POWER CUT IS THEIR	YES
IF YES, HOW MANY HOURS POWER CUT IS DONE IN A DAY	HARDLY 1 TO 2 HOURS
VOLTATE LEVEL	HIGH BUT DURING SUMMER SOME TIME VOLTAGE LEVEL GET LOW
DO YOU USE OTHER SOURCE OF ENERGY	YES
IF YES , INDICATE THE SOURCE	INVERTER
METER BOARD IS THERE	YES
REGULAR METER CHECKING IS DONE	YES
IF YES, HOW OFTEN METER CHECKING IS DONE	MONTLY
ELECTRIC SUBSTIUTION IS THERE	YES
WHAT HAPPEN IF ANY PROBLEM OCCUR	WE GIVE COMPLAIN AND THEY USED TO COME TO SOLVE THE PROBLEM
IN A DAY WHEN YOU USE ELECTRICITY	MORNING, AFTERNOON, MAXIMUM IN NIGHT
WAT OF BULBS BEEN USED	100 AND CFL BULBS ARE BEEN USED
DO YOU SWITCH OF FANS WHEN YOU GO OUT SIDE	YES
DO YOU THINK IF INCOME INCREASES THEN CONSUMPTION OF ELECTRICITY WILL INCREASE	TO SOME EXTEND YES, WHEN INCOME INCREASE WE BUY LUXARY GOOD RECENTLY WE BUY A WASHING MACHINE.
ARE YOU AWARE HOW TO SAVE ELECTRICITY	YES

AMOUNT OF ENERGY CONSUMED	1000 TO 1500 RS IN PETROL
WHAT MODE OF BACK UP YOU HAVE WHEN NO ELECTRICITY	INVERTER

WHICH OF THE FOLLOWING ELECTRICAL APPLIANCES DO YOU USE AT PRESENT AND WHICH OTHERS ARE LIKELY TO BE USE IN FUTURE

ELECTRICAL APPLIANCES	**AT PRESENT**	**IN FUTURE**
ELECTRICAL LIGHTS	YES	
LAMPS	YES	
RADIO/MUSIC SYSTEM	YES	
T.V	YES	
COMPUTER/ LAPTOP	NO	
FAN	YES	
COOLER/ AC	COOLER	
WATER HEATER	YES	
MICRO OVEN	NO	
VACCUM CLEANER	NO	
REFRIGATOR	YES	
WASHING MACHINE	YES	
MOBILE	YES	
SATELLITE DISH SYSTEM	YES	

NOTE: IF FURTER INCOME INCREASES US WILL BUY MICRO OVEN AND OTHER ELECTRICAL NEEDS TO ENJOY THE BENEFITS BUT WE WON'T MISUTILIZE THE ELECTRICITY.

ANNEXTURE-3

CASE STUDY 3 – ELECTRICITY CONSUMPTION IN URBAN AREA (SAIL QUATERS)

NAME	**MAMTA GOUDA**
SEX	FEMALE
AGE	35
BPL/APL	APL
STATE	ODISHA
DISTRICT	SUNDARGARH
BLOCK	SECTOR/4
VILLAGE	ROURKELA
DISTANCE FROM CAPITAL	350KM
TOTAL NO OF FAMILY MEMBERS	6
MARITAL STATUS	MARRIED
EDUCATION QUALIFICATION	CLASS12
NATURE OF EMPLOYMENT	SAIL EMPLLOYEE
MONTLY INCOME	25000
YEARLY INCOME	300000
HOUSE TYPE	PUCCA
FAMILY TYPE	JOINT FAMILY
PERIOD OF HABITATION	AROUND 25 YEARS
SANITATION	YES
MAIN COOKING FUEL	ELECTRIC HEATER
MOTOR CYCLE/ SCOOTER	MOTOR CYCLE
CAR	CAR
GENERATOR	NO

PUMP SET DIESEL/ ELECTRIC	NO
DO YOU HAVE ELECTRICITY AT HOME	YES
FROM WHICH SECTOR YOU GET ELECTRICITY	SAIL
DO YOU ELECTRICITY METER READING BOARD	YES
COST OF PER UNIT OF ELECTRICITY	2.31
TOTAL UNITS CONSUMED PER MONTH	ACTUALLY FOR EVERY ONE SAME AMOUNT IS BEEN DEDUCTED
MONTLY EXPENDITURE ON ELECTRICITY	359.32
DURATION OF POWER SUPPLY AVAILABLE PER DAY	24 HOURS IF ANY PROBLEM OCCOUR THEN ONLY CURRENT GOES
POWER CUT IS THEIR	YES BUT SOMETIME
IF YES, HOW MANY HOURS POWER CUT IS DONE IN A DAY	IN A WEEK SAY 1 OR 2 HOUR
VOLTATE LEVEL	HIGH
DO YOU USE OTHER SOURCE OF ENERGY	NO
IF YES , INDICATE THE SOURCE	NO
METER BOARD IS THERE	YES
REGULAR METER CHECKING IS DONE	AT FIRST THEY USE TO CHECK REGURALLY BUT KNOW THEY ARE NOT COMMING TO CHECK
IF YES, HOW OFTEN METER CHECKING IS DONE	ONCE IN A YEAR
ELECTRIC SUBSTIUTION IS THERE	YES
WHAT HAPPEN IF ANY PROBLEM OCCUR	WE USED TO GIVE COMPLAIN IN ELECTRIC SUBSITUTION SECTOR/4
IN A DAY WHEN YOU USE ELECTRICITY	IN NIGHT MAXIUM AND AFTERNOON
WAT OF BULBS BEEN USED	100, CFL BULBS
DO YOU SWITCH OF FANS WHEN YOU GO OUT SIDE	YES
DO YOU THINK IF INCOME INCREASES THEN CONSUMPTION OF ELECTRICITY WILL INCREASE	YES
ARE YOU AWARE HOW TO SAVE ELECTRICITY	YES

AMOUNT OF ENERGY USED	2500
WHAT MODE OF BACKK UP YOU HAVE WHEN NO ELECTRICITY	EMERGENCE LIGHT WHEN CURRENT IS NOT THEIR

WHICH OF THE FOLLOWING ELECTRICAL APPLIANCES DO YOU USE AT PRESENT AND WHICH OTHERS ARE LIKELY TO BE USE IN FUTURE

ELECTRICAL APPLIANCES	**AT PRESENT**	**AT FUTURE**
ELECTRICAL LIGHTS	YES	
LAMPS	YES	
RADIO/MUSIC SYSTEM	YES	
T.V	YES	
COMPUTER/ LAPTOP	NO	YES
FAN	YES	
COOLER/ AC	YES	
WATER HEATER	YES	
MICRO OVEN	YES	
VACCUM CLEANER	NO	YES
REFRIGATOR	YES	
WASHING MACHINE	YES	
MOBILE	YES	
SATELLITE DISH SYSTEM	YES CABLE	

ANNEXTURE-4

CASE STUDY 4 – ELECTRICITY CONSUMPTION IN NON-GOVERNMENT URBAN AREA (KOEL NAGAR)

NAME	**PARSURAM BARIK**
SEX	MALE
AGE	48
BPL/APL	APL
STATE	ODISHA
DISTRICT	SUNDARGARH
BLOCK	KOELNAGAR D BLOCK
VILLAGE	ROURKELA
DISTANCE FROM CAPITAL	360KM
TOTAL NO OF FAMILY MEMBERS	4
MARITAL STATUS	MARRIED
EDUCATION QUALIFICATION	CLASS 12
NATURE OF EMPLOYMENT	BUSINESS MAN
MONTLY INCOME	40000
YEARLY INCOME	AROUND 5 LAKH
HOUSE TYPE	PUCCA
FAMILY TYPE	NUCLEAR
PERIOD OF HABITATION	LAST 3 YEARS, STAYING IN A RENT HOUSE
SANITATION	YES
MAIN COOKING FUEL	LPG
MOTOR CYCLE/ SCOOTER	MOTOR CYCLE, SCOOTY
CAR	YES
GENERATOR	YES

PUMP SET DIESEL/ ELECTRIC	NO
DO YOU HAVE ELECTRICITY AT HOME	YES
FROM WHICH SECTOR YOU GET ELECTRICITY	PRIVATE
DO YOU ELECTRICITY METER READING BOARD	YES
COST OF PER UNIT OF ELECTRICITY	2.50
TOTAL UNITS CONSUMED PER MONTH	AROUND 240
MONTLY EXPENDITURE ON ELECTRICITY	700
DURATION OF POWER SUPPLY AVAILABLE PER DAY	22 HOURS
POWER CUT IS THEIR	YES
IF YES, HOW MANY HOURS POWER CUT IS DONE IN A DAY	2 HOURS
VOLTATE LEVEL	HIGH
DO YOU USE OTHER SOURCE OF ENERGY	YES
IF YES , INDICATE THE SOURCE	INVERTER
METER BOARD IS THERE	YES
REGULAR METER CHECKING IS DONE	YES
IF YES, HOW OFTEN METER CHECKING IS DONE	MONTHLY BASIS
ELECTRIC SUBSTIUTION IS THERE	NO
WHAT HAPPEN IF ANY PROBLEM OCCUR	HAVE TO GO MAIN BRANCH
IN A DAY WHEN YOU USE ELECTRICITY	YES
WAT OF BULBS BEEN USED	ONLY CFL BULBS,OF 20 WAT
DO YOU SWITCH OF FANS WHEN YOU GO OUT SIDE	YES
DO YOU THINK IF INCOME INCREASES THEN CONSUMPTION OF ELECTRICITY WILL INCREASE	YES
ARE YOU AWARE HOW TO SAVE ELECTRICITY	YES
AMOUNT OF ENERGY	3000 IN PETROL

WHAT MODE OF BACKK UP YOU HAVE WHEN NO ELECTRICITY	INVERTER

WHICH OF THE FOLLOWING ELECTRICAL APPLIANCES DO YOU USE AT PRESENT AND WHICH OTHERS ARE LIKELY TO BE USE IN FUTURE

ELECTRICAL APPLIANCES	**PRESENT**	**FUTURE**
ELECTRICAL LIGHTS	YES	
LAMPS	YES	
RADIO/MUSIC SYSTEM	YES	
T.V	YES	
COMPUTER/ LAPTOP	YES	
FAN	YES	
COOLER/ AC	YES	
WATER HEATER	YES	
MICRO OVEN	YES	
VACCUM CLEANER	NO	
REFRIGATOR	YES	
WASHING MACHINE	YES	
MOBILE	YES	
SATELLITE DISH SYSTEM	CABLE	

NOTE: THIS IS EXAMPLE OF A PERSON NAME PARSURAM BARIK PREVIOUSLY HE WAS STAYING WITH HIS FAMIL IN SECTOR 1 CHEAPTYPE QUATERS, LATER ON HIS INCOME INCREASES HE BOUGHT CAR, SCOOTY, LAPTOP, WASHING MACHINE, MICROOVEN IN A YEAR AND TAKE A RENT HOUSE IN KOELNAGER WERE THE HOUSE RENT IS HIGHER. HE AGREES WHEN HIS INCOME INCREASES HIS CONSUMPTION ON ELECTRICITY ALSO INCREASES.

ANNEXTURE-5

CASE STUDY 5 – ELECTRICITY CONSUMPTION IN RURAL AREA (BIJADHI)

NAME	**NAGI EKKA**
SEX	FEMALE
AGE	24
BPL/APL	BPL
STATE	ODISHA
DISTRICT	SUNDERGARH
BLOCK	BISRA
VILLAGE	BIJADHI
DISTANCE FROM CAPITAL	380KM
TOTAL NO OF FAMILY MEMBERS	FOUR
MARITAL STATUS	MARRIED
EDUCATION QUALIFICATION	CLASS-5
NATURE OF EMPLOYMENT	FARMING, DAILY WAGE EARNER
MONTLY INCOME	3000
YEARLY INCOME	40000
HOUSE TYPE	SEMI PUCCA
FAMILY TYPE	NEUCLEAR
PERIOD OF HABITATION	LAST 4 TO 5 YEARS
SANITATION	NO
MAIN COOKING FUEL	WOOD, CARCOAL
MOTOR CYCLE/ SCOOTER	NO
CAR	NO
GENERATOR	NO
PUMP SET DIESEL/ ELECTRIC	NO

DO YOU HAVE ELECTRICITY AT HOME	YES
FROM WHICH SECTOR YOU GET ELECTRICITY	ILLEGAL(HOOKING)
DO YOU ELECTRICITY METER READING BOARD	NO
COST OF PER UNIT OF ELECTRICITY	NO
TOTAL UNITS CONSUMED PER MONTH	NO
MONTLY EXPENDITURE ON ELECTRICITY	NO
DURATION OF POWER SUPPLY AVAILABLE PER DAY	20 HOURS
POWER CUT IS THEIR	YES
IF YES, HOW MANY HOURS POWER CUT IS DONE IN A DAY	FOUR HOURS
VOLTATE LEVEL	HIGH
DO YOU USE OTHER SOURCE OF ENERGY	NO
IF YES , INDICATE THE SOURCE	NO
METER BOARD IS THERE	NO
REGULAR METER CHECKING IS DONE	NO
IF YES, HOW OFTEN METER CHECKING IS DONE	NO
ELECTRIC SUBSTIUTION IS THERE	NO
WHAT HAPPEN IF ANY PROBLEM OCCUR	PEOPLE USE TO SOLVE BY THEMSELVES
IN A DAY WHEN YOU USE ELECTRICITY	MAINLY AT NIGHT
WAT OF BULBS BEEN USED	FIVE 100 WATT BULBS
DO YOU SWITCH OF FANS WHEN YOU GO OUT SIDE	YES
DO YOU THINK IF INCOME INCREASES THEN CONSUMPTION OF ELECTRICITY WILL INCREASE	YES
ARE YOU AWARE HOW TO SAVE ELECTRICITY	YES
AMOUNT OF ENERGY	NO
WHAT MODE OF BACKK UP YOU HAVE WHEN NO ELECTRICITY	NO

WHICH OF THE FOLLOWING ELECTRICAL APPLIANCES DO YOU USE AT PRESENT AND WHICH OTHERS ARE LIKELY TO BE USE IN FUTURE

ELECTRICAL APPLIANCES	**IN PRESENT**	**IN FUTURE**
ELECTRICAL LIGHTS	YES	YES
LAMPS	YES	YES
RADIO/MUSIC SYSTEM	NO	YES
T.V	NO	YES
COMPUTER/ LAPTOP	NO	YES
FAN	YES	YES
COOLER/ AC	NO	YES
WATER HEATER	NO	YES
MICRO OVEN	NO	YES
VACCUM CLEANER	NO	YES
REFRIGATOR	NO	YES
WASHING MACHINE	NO	YES
MOBILE	YES	YES
SATELLITE DISH SYSTEM	NO	YES

ANNEXURE-6

QUESTIONNAIRES USED IN THE FIELD STUDY

Sl. No.____

NATIONAL INSTITUTE OF TECHNOLOGY

Rourkela, Odisha – 769008

A COMPARATIVE STUDY OF CONSUMPTION PATTERN OF ELECTRICITY IN URBAN AND RURAL HOUSEHOLD

(PRAGYAN DASH, ROLL NO – 411HS1001)

Name of the Respondent:

Age:

SECTION 1:

1.1. Geographic Information

State		District		Block	
Gram Panchayat		Village/Town		Distance from the Capital	

1.2. Household composition

Sl. No.	Name (Start with head of Household)	Sex	Age	Marital Status (Married 1; Single 2)	Education qualifications
1					
2					
3					
4					
5					
6					
7					
8					

SECTION 2: ECONOMIC PROFILE

2.1 Status of Employment and Annual Income

Name of family member	Age	Nature of Employment		Monthly/ Yearly income in Rs.
		Primary	Secondary	

2.2 Housing and other amenities

Housing and other amenities	Types	Remarks
House type	1-Pucca/ 2-Semi-Pucca/ 3-Kutcha/ 4-Hut/ 5-Temporary	
Family type	1-Joint family; 2-Nuclear family	
Period of Habitation	1-Less than 10 years; 2-More than 10 years	
Sanitation	1-yes, 2-no	
Kitchen room	1-Separate/ 2-Attached	
Main Cooking fuel	1-Wood, 2-Charcoal,3-Kerosine, 4-Cow dung, 5-Gas, 6-Electric	
Main source Drinking water	1-Tube well, 2- open well, 3-stream, 4-pond	
Cow shed	1-yes, 2-no	

2.3 Ownership of Household Movable Asset

Particulars	1-Yes/ 2-No	Type of Energy Use	Amount of Energy Consume
Motor cycle/Scooter			

Car			
Tractor			
Generator			
Truck			
Pump sets-diesel/electric			
Other			

SECTION 3

3.1 DO YOU HAVE ELECTRICITY AT YOUR HOME – YES/NO:

3.2. IF YES, THEN FROM WHICH SOURCE YOU ARE GETTING ELECTRICITY:

GOVERNMENT SECTOR	PRIVATE SECTOR	OTHERS

3.3 DO YOU HAVE ELECTRICITY METER READING BOARD – YES/NO:

3.4 IF YES, COST PER UNIT -

RS-2	RS-3	RS-4	RS-5	ABOVE

3.5 UNIT OF ELECTRICITY CONSUMED PER MONTH-

10-20 UNIT	20-30 UNIT	30-40 UNIT	40- 50 UNIT	ABOVE

3.6 TOTAL AMOUNT OF ELECTRICITY FEE PAID-

MONTHLY	Rs.	ANNUALLY	Rs.

3.7 MONTLY EXPENDITURE ON ELECTRICITY CONSUMPTION-

RS 100-200	RS 200-300	RS 300-400	RS 400-500	ABOVE

3.8 DURATION OF POWER SUPPLY AVAILABLE PER DAY-

Less than 1 HOUR	2-4 HOURS	4-8 HOURS	8-12 HOURS	24 HOURS	OTHER

3.9 HOW OFTEN DO YOU HAVE POWER CUT – YES/NO:

3.10 IF YES, THEN FOR HOW MANY HOURS POWER CUT IS DONE-

1 HOUR	2 HOUR	3 HOUR	5 HOUR	6 HOUR	ABOVE

3.11 VOLTAGE LEVEL-

LOW VOLTAGE	MEDIUM VOLTAGE	HIGH VOLTAGE

3.12 DO YOU USE ANY OTHER SOURCE OF POWER SUPPLY – YES/NO:

IF YES, INDICATE THE SOURCE	

3.13 IS METER READING IS CHECK REGULARLY- YES/NO:

3.14 IF YES, HOW OFTEN IS IT CARRIED OUT-

MONTLY BASIS	HALF YEARLY BASIS	YEARLY BASIS

3.15 ANY PROBLEM OCCURS WHEN ECLECTRICITY POWER CUT IS THERE:

3.16 IN CASE OF ANY PROBLEM, IS THERE ANY ELECTRICITY SUBSTIUTION? YES/NO

3.17 IF YES, WHAT MODE OF BACK-UP IS USED –

GENERATOR	INVERTER	SOLAR	OTHER

3.18 DO YOU USE ELECTRICITY IN MORNING-YES/NO?

3.19 DO YOU USE ELECTRICITY IN AFTERNOON-YES/NO?

3.20 HOW MUCH WAT OF BULBS ARE BEEN USED –

20 WAT	40 WAT	60 WAT	100 WAT	OTHER

3.21 DO YOU SWITCH OFF FANS, LIGHT AND OTHER ELECTRIC DEVICES WHEN YOU GO OUTSIDE-YES/NO?

3.23 DO YOU THINK YOUR CONSUMPTION ON ELECTRICITY INCREASES IF YOUR INCOME INCREASES IN FUTURE? –YES/NO:

3.24. YOUR APPLIANCES

WHICH OF THE FOLLOWING ELECTRICAL APPLIANCES DO YOU USE AT PRESENT, AND WHICH OTHERS ARE LIKELY TO BE USE IN FUTURE-

ELECTRICAL APPLIANCES	AT PRESENT	IN FUTURE
ELECTRIC LIGHTS		
LAMPS		
RADIO/MUSIC SYSTEM		
T.V		
COMPUTER/LAPTOP		
FAN (HANGING/TABLE)		
COOLER/A.C.		
WATER HEATER		
MICRO OVEN		
VACCUM CLEANER		
REFRIGATOR		
WASHING MACHINE		

MOBILE		
SATELLITE DISH SYSTEM		

3.25 ARE YOU AWARE - HOW TO SAVE ELECTRICITY-YES/NO:

3.26 IF YES, THEN HOW WOULD YOU SAVE ELECTRICITY-EXPLAIN?

3.27 IF NO, THEN I WILL TRY TO GIVE THEM AWARENESS CAMPAIGN.

ABBREVIATIONS:

1. NIT- National Institute of technology
2. CFL- Compact fluorescent
3. LPG- Liquefied petroleum gas
4. BPL-Below poverty line
5. APL-Above poverty line
6. SAIL- Steel Authority Limited
7. WESCO- Western electricity supply company of Orissa
8. NPC- National productivity council
9. BEE- Bureau of energy council
10. AC- Air conditioner
11. MPCE- Monthly per capita expenditure
12. UNDP- United National development programme.
13. SPSS- Statistics package for statically analysis